

91-02481/

SAND AND GRAVEL RESOURCES
OF THE FT. McMURRAY AREA

MAP SHEETS

WOOD CREEK (TO TOP OF Tp90 IN 74D/14)

FT. McMURRAY (74D/11)

UNNAMED (Tp83 R11 IN 74D/5)

HORSE RIVER (Tp83 R11 IN 74D/4)

Open File Report 1988-16

D.W. Scafe
W.A.D. Edwards
D.R. Boisvert
1988

TABLE OF CONTENTS

	Page
ABSTRACT	1
INTRODUCTION	2
ACKNOWLEDGMENTS	2
METHODS	4
GEOLOGY	4
Physiography and Bedrock	4
Surficial Geology	8
SAND AND GRAVEL RESOURCES	8
BIBLIOGRAPHY	11
APPENDIX I Pit/Site Descriptions for Map Area 74D/14 . . .	12
APPENDIX II Pit/Site Descriptions for Map Area 74D/11 . . .	21
APPENDIX III Pit/Site Descriptions for Map Area 74D/5 . . .	59
APPENDIX IV Pit/Site Descriptions for Map Area 74D/4 . . .	67

ILLUSTRATIONS

Figure 1 Location Map	3
Figure 2 Physiography and Bedrock of the Study Area	6
Figure 3 Sand and Gravel Resources of Map 74D/14 . . . (in pocket)	
Figure 4 Sand and Gravel Resources of Map 74D/11 . . . (in pocket)	
Figure 5 Sand and Gravel Resources of Map 74D/5 . . . (in pocket)	
Figure 6 Sand and Gravel Resources of Map 74D/4 . . . (in pocket)	
Table 1 Levels of Aggregate Inventory Mapping	5
Plate 1 EM31 traverse across a large kame moraine deposit in LSD9 Sec7 Tp83 R11 W4M	10

ABSTRACT

Aggregate materials present in parts of the Fort McMurray (74D) map area were studied in 1987. This study area covers 1385km² on four 1:50000 map sheets at a regional mapping level. The program consisted of compiling existing information, air photo interpretation, field investigation of sites and laboratory analyses. In addition, selected sites, identified as prospects in a previous air photo study, were evaluated. Sand and gravel are distributed unevenly and are of variable quality and quantity. Most of the granular material in the study area is sand. The major sand and gravel deposits in the study area are glaciofluvial in origin (meltwater channel and kame). Major deposits in the northern part of the study area, adjacent to the Clearwater and Athabasca Rivers, are meltwater channel deposits. In the southern part of the study area, aggregate material has been extracted from kames.

INTRODUCTION

This study is part of a program initiated in 1976 by the Alberta Research Council and Alberta Forestry, Lands and Wildlife to provide information on the aggregate resources of the Province of Alberta. The area of study (Figure 1), level of detail and materials to be investigated were determined by the Resource Evaluation and Planning Division (REAP) of Alberta Forestry, Lands and Wildlife (AFLW). The actual investigations were conducted by the Alberta Geological Survey, a department of the Alberta Research Council.

The study was completed at the regional mapping level (category 3, Table 1). This type of mapping is designed to provide a minimum data level for local and regional planning and management of aggregate resources in the province and to form a base for resource management.

Two major study areas are defined in the Fort McMurray (74D) map sheet. The northern study area is bounded on the south by the southern boundary of map sheet 74D/11 and on the north by the northern boundary of Township 90 in map sheet 74D/14. The eastern and western boundaries of the northern study area are the boundaries of the map sheets. The southern study area consists of Townships 83 and 84, Range 11 in map areas 74D/4 and 74D/5. Selected sites were visited in map sheets 74D/3 and 74D/6. Ft. McMurray, with a population of approximately 35 000 is the population centre for the region.

ACKNOWLEDGMENTS

Dianne Goulet performed the laboratory analyses and Monica Price gave her usual superior assistance in the office. Barry Fildes provided major assistance during production of the report. Funds for the project were provided by Resource Evaluation and Planning Division of Alberta Forestry, Lands and Wildlife. Special acknowledgment is given to Alberta Forest Service Chief Ranger Ralph Woods and his associates for their many courtesies during the field program. Provision of helicopter time and

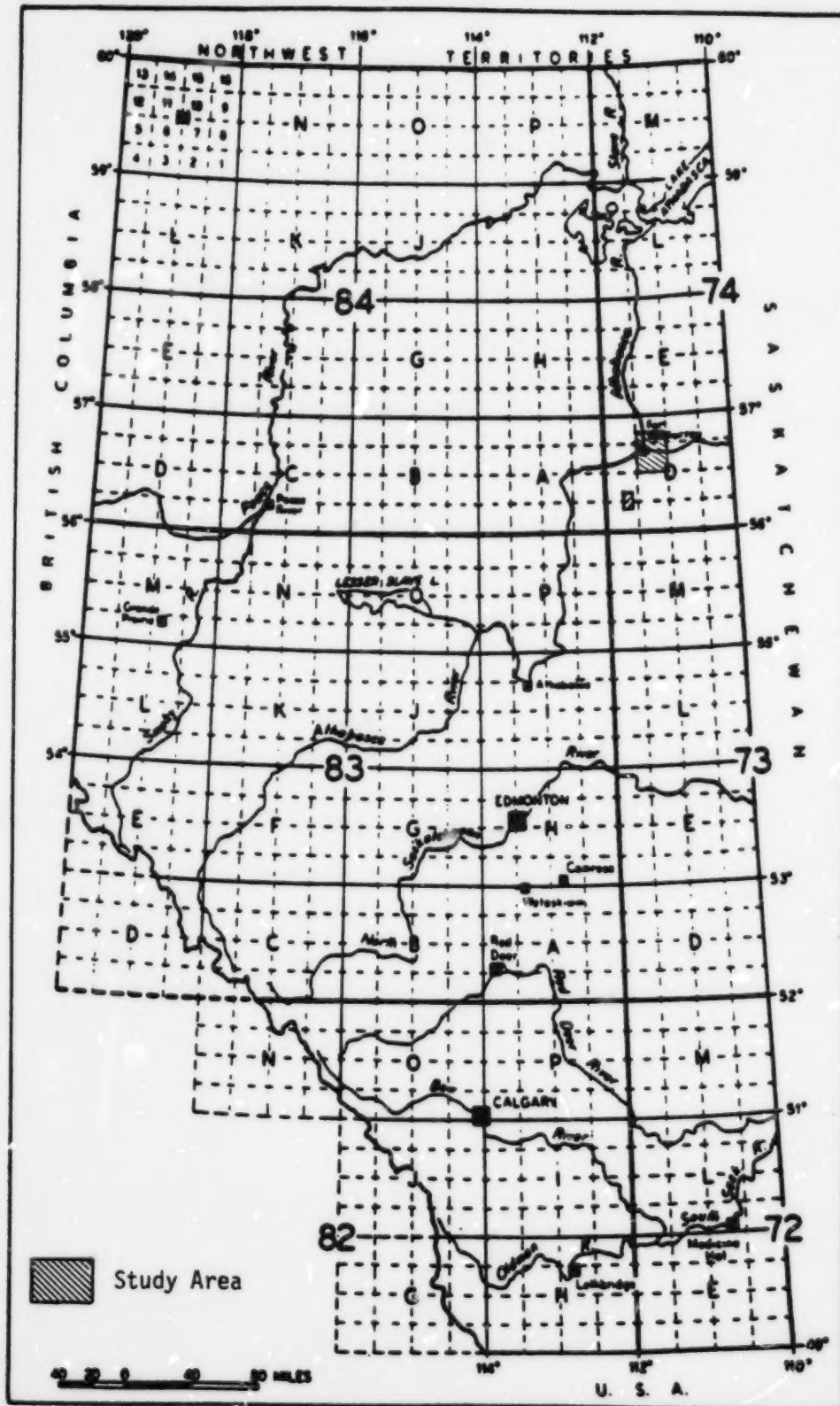


Figure 1 Location Map

camp were of special assistance.

METHODS

The study was initiated with the review and compilation of existing information. Included were data from water well logs from Alberta Environment and the files of Alberta Transportation.

The next stage of the investigation involved air photo interpretation of the study area by the principal investigators. This provided a base of information comparable to category 5 as shown on table 1. The primary area of interest to AFLW was then studied in more detail and a number of sites were identified for ground checking.

Field work was conducted in June, July and August, 1987 by foot, three-wheel all terrain cycle, truck and helicopter. Summer access by wheeled vehicles is limited. However, all of the important features identified were visited. Samples were returned to the laboratory for grain size and petrographic analyses. A limited number of geophysical traverses using a Geonics EM31 were made in an attempt to detect buried granular material.

This report is based mainly on surface geological observation, field checking and limited laboratory data. Application of the results should take into account the reconnaissance nature of the study.

GEOLOGY

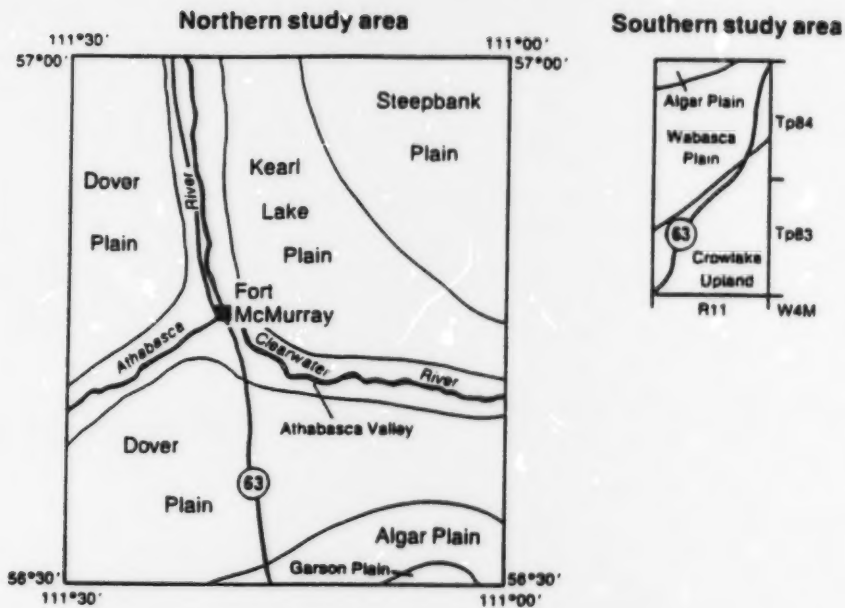
Physiography and Bedrock

Major physiographic features (Pettapiece, 1986) within the northern study area are classified in two sections from the Northern Alberta Lowlands Region and one section from the Saskatchewan Plains Region. The two sections in the Northern Alberta Lowlands Region (Figure 2) are the McMurray Lowland Section and the Wabasca Lowland Section. Within each of these sections are two districts. The Dover Plain District in the McMurray

Table 1. AGGREGATE INVENTORY MAPPING LEVELS

Format	Reconnaissance Study 5	Enhanced Reconnaissance Study 4	Regional Mapping 3	Detailed Mapping 2	Deposit Evaluation 1
Scale (Common)	1:250,000 (approx. 11x14 townships)	1:250,000 (approx. 11x14 townships)	1:50,000 (approx. 3x3 townships)	1:10,000	1:10,000 or larger
Mapping Methodology	Derived from existing surficial geology information. Aerial photograph interpretation.	Derived from existing surficial geology information. Aerial photograph interpretation. Some field traverses and site examination.	Aerial photograph interpretation Field traverses. Site examinations. Selected deposit testing. Laboratory testing.	Sedimentological studies. Site examination. Deposit testing. Laboratory testing.	Test pitting on an established grid. Hole logging. Materials analysis.
Uses	Broad scale planning. Preliminary aggregate exploration.	Broad scale planning. Preliminary aggregate exploration. Preliminary resource assessment.	Land use planning. Resource management. Resource estimates.	Land management. Reserve estimates. Deposit management.	Deposit evaluation. Development plan preparation.
Comments	Only potential areas suitable for finding deposits shown. Fairly quick and in- expensive to produce.	Potential areas suitable for finding deposits are shown. Some deposits are examined. A map will take 6 months to a year to produce.	Estimates deposit boundaries and gives quality and quantity estimations. A map may take 8 months to a year to produce.	Establishes deposit boundaries. Refines quantity/quality information. Fairly expensive survey.	Precise quality and quantity estimates. Deposit variations identified. Very expensive survey.
Output	2 map sheets per prof-year.	1 map sheet per prof-year.	2 to 3 map sheets per prof-year.	Special projects only.	Special projects only.

Physiography



Bedrock Geology

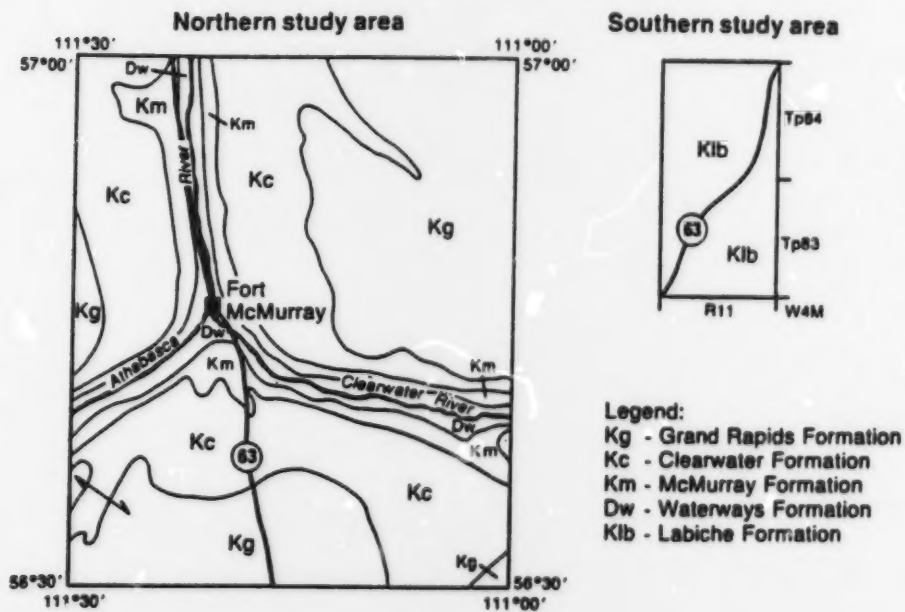


Figure 2. Physiography and Bedrock of the Study Area.

Lowland Section covers parts of two townships and four ranges and reaches a maximum elevation of 490m. The Kearn Lake Plain, also in the McMurray Lowland Section, covers parts of three townships and three ranges and reaches a maximum elevation of 460m. The Athabasca Valley District in the Wabasca Lowland Section covers parts of four townships and four ranges and reaches a minimum elevation of 250m. The section in the Saskatchewan Plains Region (Figure 2) is the Methy Portage Plains Section. Within this section, the Steepbank Plain District covers parts of three townships and two ranges and reaches a maximum elevation of 520m.

The southern study area plus the selected sites have physiographic features in one section from the Northern Alberta Lowlands Region and one section from the Northern Alberta Uplands Region. The section in the Northern Alberta Lowlands Region is the Wabasca Lowland Section which in turn is subdivided into two districts. The Wabasca Plain District covers parts of two townships and one range and reaches a minimum elevation of 550m. The Algar Plain District covers part of one township and one range and reaches a minimum elevation of 430m. The section in the Northern Alberta Uplands is the Stony Mountain Upland Section. Within this section is the Crow Lake Upland District which covers parts of two townships and one range, at a maximum elevation of 760m.

Bedrock (Figure 2) in the northern study area is mainly Early Cretaceous in age and is underlain by rock of Devonian Age. The Dover Plain District and the Kearn Lake Plain District are underlain by three formations of Lower Cretaceous material. The McMurray Formation is a thick bedded, quartzose sandstone and siltstone, oil impregnated, marine deposit. The Clearwater Formation consists of dark gray, marine, fossiliferous, silty shale, laminated siltstone and fine grained cherty sandstone. The Grand Rapids Formation, consisting of fine grained quartzose and feldspathic sandstone, laminated siltstone and silty shale, is a shoreline complex deposit. The Steepbank Plain Section is underlain by the Grand Rapids Formation. The Waterways Formation of Devonian Age, underlying the Athabasca Valley District, is composed of marine, gray and greenish gray shale and argillaceous limestone interbedded with gray and greyish brown, fine grained to coarse clastic limestone.

Bedrock (Figure 2) in the southern study area is the La Biche Formation of Early to Late Cretaceous Age. The formation consists of dark gray, marine shale and silty shale with ironstone partings and concretions and silty, fish scale bearing beds in the lower part.

Surficial Geology

The surficial material (Bayrock and Reimchem, 1973) of the northern study area is of Recent and Pleistocene age. The Dover Plain Section is covered mainly by glaciolacustrine deposits of clay and silt with minor eolian deposits of fine sand. The Steepbank Plain Section is covered primarily by till and glaciolacustrine material. The Athabasca Valley contains glaciofluvial meltwater, outwash and kame deposits and alluvial deposits of silt, sand and clay.

The southern study area is covered with till, glaciofluvial and minor glaciolacustrine materials.

SAND AND GRAVEL RESOURCES

Gravel and sand deposits in the area are variable. Most are only small pockets of gravel, thin sheets of sand or thin sheets of gravelly sand.

Deposit, pit, site and/or sample locations and a description of the aggregate resources in the study area are given in figures 3 to 6 (in pocket). Deposit, pit and site descriptions and laboratory data are in Appendices I to IV.

The northern study area is covered mainly by glaciolacustrine materials (Bayrock and Reimchem, 1973). Topography of the area, away from the river valleys, is fairly low and the material at the surface is mainly clay and silt with minor amounts of sand. The Clearwater and Athabasca River valley bottoms contain primarily fine grained Recent alluvial and Pleistocene glaciofluvial material. Material with clasts is rare. Glaciofluvial material, on high ground away from the river valleys, is

variable in composition and extent. Such material south of the Clearwater River is a source of sand and gravelly sand for the area (Fox, 1980). The deposits, however, are shallow, lie on the sides of low ridges and overlie clay or till. A drilling and backhoe testing program by Athabaska Realty (1975) in this area revealed material containing clasts in only 17 of 212 test holes. Eolian sand is present in minor amounts north of the Clearwater River (Bayrock and Reimchen, 1973). This area is covered mainly by glaciolacustrine clay and silt and muskeg swamps. The area west of the Athabasca River also is covered mainly by glaciolacustrine clay and silt and muskeg swamp at higher elevations.

The southern study area is covered by till and glaciofluvial material. Topography is rolling. The material in this area is primarily clay and silt. The till contains both clasts of igneous rocks from the Precambrian Shield and quartzite from the Athabasca Formation in northeastern Alberta. Kame and kame moraine deposits (Plate 1) along Hwy 63 have been exploited for aggregate in several areas. The material primarily is sand to gravelly sand. There are no major gravel deposits in the area other than the kame deposits.

All major gravel deposits in the northern and southern study areas have been located and exploited. There are small pockets of aggregate remaining as indicated in the site descriptions. However, our study indicates that no major deposits containing abundant clasts are present in the area. Any additional aggregate exploration in the region should focus on buried deposits which would show no surface expression and would not have been detected by this or previous research programs.



Plate 1. EM31 traverse across a large kame moraine deposit in LSD9 Sec7 Tp83 R11 W4M

BIBLIOGRAPHY

Athabasca Realty Co. Ltd. (1975) Field search for granular material in the vicinity southeast of the New Town of Ft. McMurray; Commissioned by the Northern Alberta Region, Office of the Commissioner.

Bayrock, L.A. and T.H.F Reimchen (1974) Surficial geology, Waterways, NTS 74D; Map; Edmonton: Alberta Research Council.

Fox, J.C. (1980) Sand and gravel resources of the Athabasca Oil Sands Region northeastern Alberta; Alberta Research Council Open File Report 1980-7.

Green, R. (1972) Geological Map of Alberta; Edmonton: Alberta Research Council.

Pettapiece, W. (1986) Physiographic Subdivisions of Alberta: Land Resource Research Centre, Research Branch, Agriculture Canada, Ottawa.

Hanley, P.T. and C. Van Waas (1973) Biophysical analysis and evaluation of capability, Ft. McMurray - Gregoire Lake Area; Land Use Assignment Branch, Technical Division, Alberta Department of Lands and Forests.

Hackbarth, D.A. and N. Nastasa (1979) The hydrogeology of the Athabasca Oil Sands Area, Alberta; Bulletin 38; Edmonton: Alberta Research Council.

McLaws, I.J. (1980) Silica sands in the Ft. McMurray area, Alberta; Economic Geology Report 6; Edmonton: Alberta Research Council.

Mollard, J.D. and D.G. Mollard (1974) Office airphoto study of sand and gravel prospects, vicinity of Fort McMurray, Alberta; J.D. Mollard and Associates June 28, 1974.

APPENDIX I

PIT/SITE DESCRIPTIONS FOR MAP AREA 74D/14

DEPOSIT 1

LOCATION: LSD14 Sec21 Tp90 R9 W4M
LSD3,4 Sec28 Tp90 R9 W4M
LSD3,5,6 Sec28 Tp90 R9 W4M
LSD8 Sec29 Tp90 R9 W4M

No. of associated pits/sites: 1

No. of samples analysed: None

DEPOSIT DESCRIPTION:

See site description below.

Site Location: LSD5 Sec28 Tp90 R9 W4M

Site Description:

Ridge 6m high of slightly dirty, fine sand with fewer than 1% clasts.
Mollard (1974) Site 231.

DEPOSIT 2

LOCATION: LSD14 Sec 21 Tp90 R9 W4M
LSD2,3,6,7,8,9,10,11,12,15,16 Sec33 Tp89 R9 W4M

No. of associated pits/sites: 1

No. of samples analysed: None

DEPOSIT DESCRIPTION:

See site description below.

Site Location: LSD16 Sec33 Tp89 R9 W4M

Site Description:

Clean, fine to medium grained sand.

DEPOSIT 3

LOCATION: LSD10,11,12,13,14,15 Sec 32 Tp89 R8 W4M
LSD3,4,5,6 Sec5 Tp90 R8 W4M
LSD1,2,7,8 Sec6 Tp90 R8 W4M

No. of associated pits/sites: 1

No. of samples analysed: None

DEPOSIT DESCRIPTION:

See site description below.

Site Location: LSD3 Sec5 Tp90 R8 W4M

Site Description:

Clean, fine sand. Mollard (1974) Site 82.

DEPOSIT 4

LOCATION: LSD13 Sec13 Tp90 R8 W4M
LSD15,16 Sec14 Tp90 R8 W4M
LSD1,2 Sec23 Tp90 R8 W4M
LSD1,2,4,6 Sec24 Tp90 R8 W4M

No. of associated pits/sites: 1

No. of samples analysed: None

DEPOSIT DESCRIPTION:

See site description below.

Site Location: LSD1 Sec23 Tp90 R8 W4M

Site Description:

Ridge 5m high of fine to medium grained sand. Mollard (1974) Site
232/85.

PITS/SITES OUTSIDE DEPOSIT BOUNDARIES

Site Location: LSD16 Sec35 Tp89 R9 W4M

Site Description:

Clayey silt with 1% clasts to 15cm on 11m high ridge. Mollard (1974) Site 81.

Site Location: LSD15 Sec34 Tp89 R9 W4M

Site Description:

Helicopter flyover. Poplar and spruce forest with standing water. Probably clayey silt or till below.

Site Location: LSD10 Sec30 Tp90 R9 W4M

Site Description:

Clayey silt.

Site Location: LSD8 Sec30 Tp90 R7 W4M

Site Description:

Ridge 2m high with fine to medium clean sand and 1% clasts to 5cm.

Site Location: LSD2 Sec31 Tp90 R7 W4M

Site Description:

Helicopter flyover of section exposing 4m of bedded, clayey silt with 1% clasts to 15cm. Underlain by bedrock. Mollard (1974) Site 93.

Site Location: LSD3 Sec3 Tp90 R8 W4M

Site Description:

Till.

Site Location: LSD8 Sec7 Tp90 R8 W4M

Site Description:

Helicopter flyover. Poplar forest with some pines probably overlying clayey silt.

Site Location: LSD13 Sec8 Tp90 R8 W4M

Site Description:

Clayey silt.

Site Location: LSD16 Sec9 Tp90 R8 W4M

Site Description:

Veneer, 15cm thick, of sand overlying clayey silt and sand with 1% clasts to 25cm. Mollard (1974) Site 232/84.

Site Location: LSD7 Sec13 Tp90 R8 W4M

Site Description:

Helicopter flyover. Vegetation is mainly spruce and poplar, probably overlying till.

Site Location: LSD8 Sec16 Tp90 R8 W4M

Site Description:

Veneer, 10-15cm thick, of fine sand over till. Mollard (1974) Site 232/84.

Site Location: LSD7 Sec22 Tp90 R8 W4M

Site Description:

Dirty silt to fine sand. Mollard (1974) Site 92.

Site Location: LSD1 Sec27 Tp90 R8 W4M

Site Description:

Helicopter flyover. Spruce forest with patches of pine probably underlain with silt or till.

Site Location: LSD8 Sec3 Tp90 R9 W4M

Site Description:

Helicopter flyover. Poplar and spruce forest with standing water. Probably clayey silt or till below.

Site Location: LSD9 Sec8 Tp90 R9 W4M

Site Description:

Till or colluvium with clasts to 10cm. Abundant, angular limestone clasts suggest close proximity to bedrock.

Site Location: LSD15 Sec10 Tp90 R9 W4M

Site Description:

Helicopter flyover. Abundant black spruce and poplar probably overlying clayey silt or till.

Site Location: LSD8 Sec11 Tp90 R9 W4M

Site Description:

Ridge 4m high of slightly clayey silt to fine sand.

Site Location: LSD15 Sec11 Tp90 R9 W4M

Site Description:

Helicopter flyover. Poplar forest on small ridge with some pine interspersed. Probably clayey silt or till below.

Site Location: LSD2 Sec12 Tp90 R10 W4M

Site Description:

Helicopter flyover. Spruce and poplar forest with standing water. Probably clayey silt or till below.

Site Location: LSD7 Sec21 Tp90 R9 W4M

Site Description:

Clayey silt. Mollard (1974) Site 231.

Site Location: LSD10 Sec30 Tp90 R9 W4M

Site Description:

Clayey silt.

Site Location: LSD12 Sec25 Tp90 R10 W4M

Site Description:

Clean, fine to medium grained sand on three ridges 2m above
surrounding swamp.

APPENDIX II

PIT/SITE DESCRIPTIONS FOR MAP AREA 74D/11

DEPOSIT 1

LOCATION: LSD6,10,9 Sec19 Tp89 R8 W4M

No. of associated pits/sites: 1

No. of samples analysed: None

DEPOSIT DESCRIPTION:

See site description below.

Site Location: LSD10 Sec19 Tp89 R8 W4M

Site Description:

Clean, fine to medium sand.

DEPOSIT 2

LOCATION: LSD6,7,11,15,16 Sec8 Tp87 R8 W4M
LSD7,8,10,9,15,16 Sec9 Tp89 R8 W4M
LSD1 Sec10 Tp89 R8 W4M
LSD4,5 Sec11 Tp89 R8 W4M

No. of associated pits/sites: 5

No. of samples analysed: None

DEPOSIT DESCRIPTION:

Clean, fine to medium grained sand.

Site Location: LSD6 Sec8 Tp89 R8 W4M

Site Description:

Helicopter flyover. Pine cover, probably over sand.

Site Location: LSD10 Sec8 Tp89 R8 W4M

Site Description:

Helicopter flyover. Poplar and willow cover with standing water.
Probably underlain with clayey silt or till.

Site Location: LSD15 Sec8 Tp89 R8 W4M

Site Description:

Helicopter flyover. Mainly pine cover. Probably underlain with sand.

Site Location: LSD9 Sec9 Tp89 R8 W4M

Site Description:

Clean, fine to medium grained sand.

Site Location: LSD1 Sec10 Tp89 R8 W4M

Site Description:

Clean, fine to medium grained sand.

DEPOSIT 3

LOCATION: LSD13 Sec7 Tp89 R7 W4M
LSD9,10,15,16 Sec12 Tp89 R8 W4M
LSD1,2 Sec13 Tp89 R8 W4M

No. of associated pits/sites: 1

No. of samples analysed: None

DEPOSIT DESCRIPTION:

See site description below.

Site Location: LSD13 Sec7 Tp89 R7 W4M

Site Description:

Clean, fine to medium grained sand.

DEPOSIT 4

LOCATION: LSD9,10,11,14,15,16 Sec9 Tp89 R7 W4M
LSD1,2 Sec16 Tp89 R7 W4M

No. of associated pits/sites: 2

No. of samples analysed: None

DEPOSIT DESCRIPTION:

Clean silt to fine sand.

Site Location: LSD1 Sec9 Tp89 R7 W4M

Site Description:

Clean silt to fine sand. Mollard (1974) Site 51.

Site Location: LSD14 Sec9 Tp89 R7 W4M

Site Description:

Kettle hole with clean, fine grained sand. Mollard (1974) Site 51.

DEPOSIT 5

LOCATION: LSD7,10 Sec35 Tp88 R9 W4M

No. of associated pits/sites: 2

No. of samples analysed: None

DEPOSIT DESCRIPTION:

Veneer of cobbly to pebbly, fine to medium grained sand over till.

Site Location: LSD7 Sec35 Tp88 R9 W4M

Site Description:

Cobbly to pebbly, fine to medium grained sand. Maximum clast size is 30cm.

Site Location: LSD10 Sec35 Tp88 R9 W4M

Site Description:

Results of a southward 150m traverse along a cut line with the EM31 indicate that the bouldery sand at the surface probably is a veneer over till.

DEPOSIT 6

LOCATION: LSD3,5,6 Sec36 Tp88 R9 W4M

No. of associated pits/sites: 2

No. of samples analysed: None

DEPOSIT DESCRIPTION:

Fine to medium grained sand. Clean to dirty. Clasts less than 1%.

Site Location: LSD5 Sec36 Tp88 R9 W4M

Site Description:

Clean, fine to medium grained sand with 1% clasts to 40cm. Very few clasts are smaller than 10cm.

Site Location: LSD6 Sec36 Tp88 R9 W4M

Site Description:

Primarily sand, dirty in some areas. One small lens of dirty gravel 2m wide.

DEPOSIT 7

LOCATION: LSD5,12,13 Sec25 Tp88 R9 W4M
LSD8,9,16 Sec26 Tp88 R9 W4M
LSD1,8 Sec35 Tp88 R9 W4M

No. of associated pits/sites: 7

No. of samples analysed: 6

DEPOSIT DESCRIPTION:

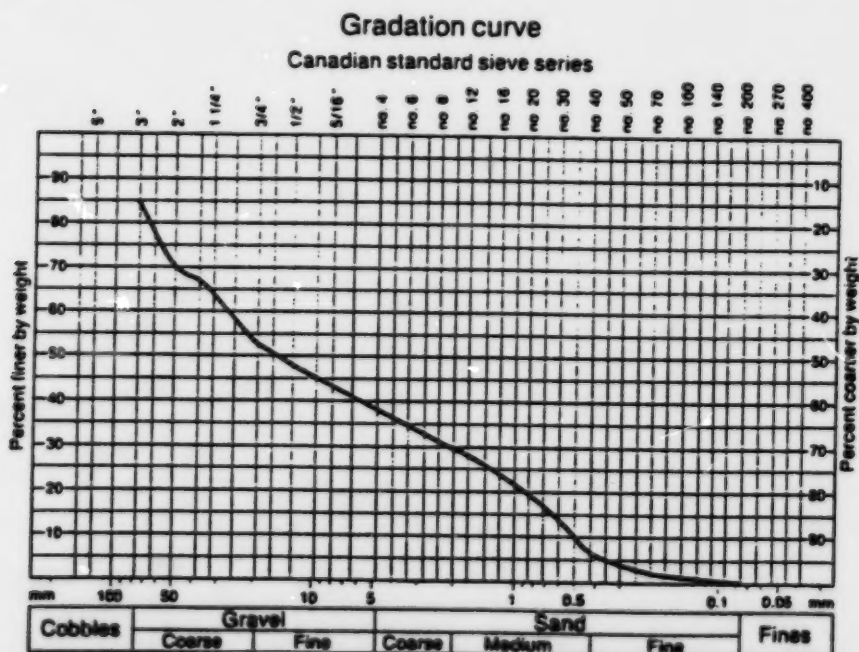
Interbeds of fine, clean sand with dirty, poorly graded gravelly sand. Clasts are less than 10% and are primarily subangular to subrounded igneous rocks from the Canadian Shield with some hard sandstone and quartzite. Ironstone and till clasts are common.

Site Location: LSD5 Sec25 Tp88 R9 W4M

Site Description:

Roadcut exposing 2m of clean, poorly graded gravelly sand overlying till and below 10cm of overburden. Maximum clast size is 75cm but most material is smaller than 4mm. Clasts are mostly subangular to subrounded igneous rocks from the Canadian Shield or quartzite. Ironstone clasts are abundant and commonly are broken. This is an isolated pocket of material with clasts as the material present in the surrounding area is sand.

Gradation: 14.0% cobbles 47.0% gravel
38.0% sand 1.0% fines



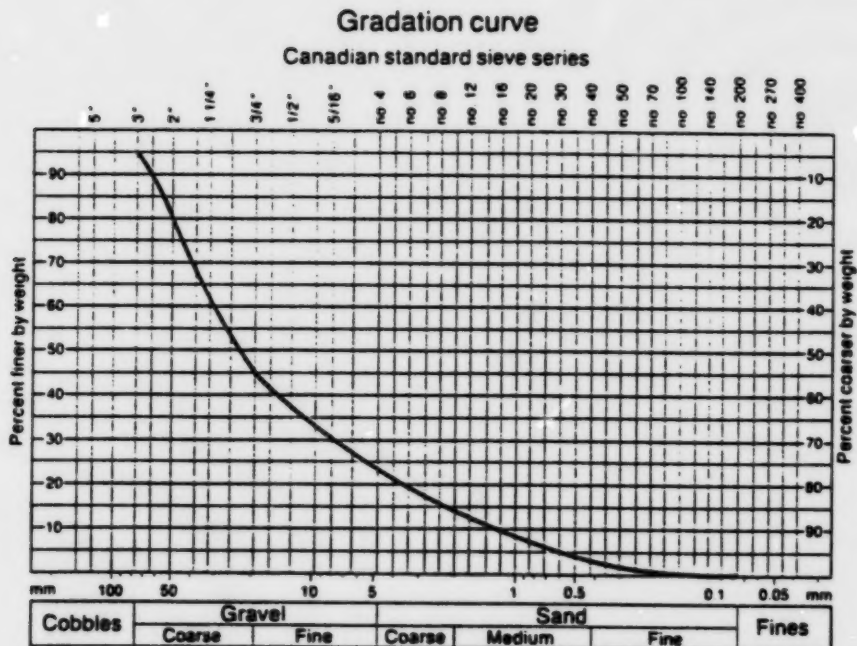
Pit Location: LSD9 Sec26 Tp88 R9 W4M

Pit Description:

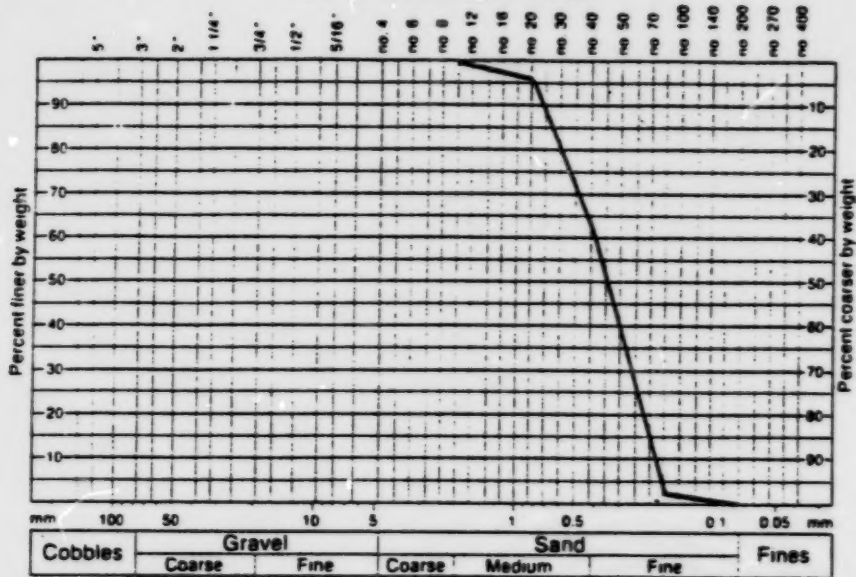
Exposure of 5.75m of well graded, dirty gravel overlain by 10cm of overburden. Maximum clast size is 75cm - 1m. Clast are subangular to subrounded and sand grains are sharp. Igneous rocks from the Canadian Shield compose approximately 40% of the clasts with hard sandstone and quartzite each composing approximately 10%. Till clasts are common and are reported to be more common to the east. Horizontal bedding is poorly developed. A lens, 4m high and 10m long, of fine sand with minor pebbles is present below gravel at the east edge of the exposure. Iron stain blotches are present throughout.

Gradation: 3.8% cobbles 73.1% gravel
22.5% sand 0.6% fines

0.0% cobbles 0.4% gravel
99.4% sand 0.2% fines



Gradation curve Canadian standard sieve series



Pit Location: LSD9 Sec26 Tp88 R9 W4M

Pit Description:

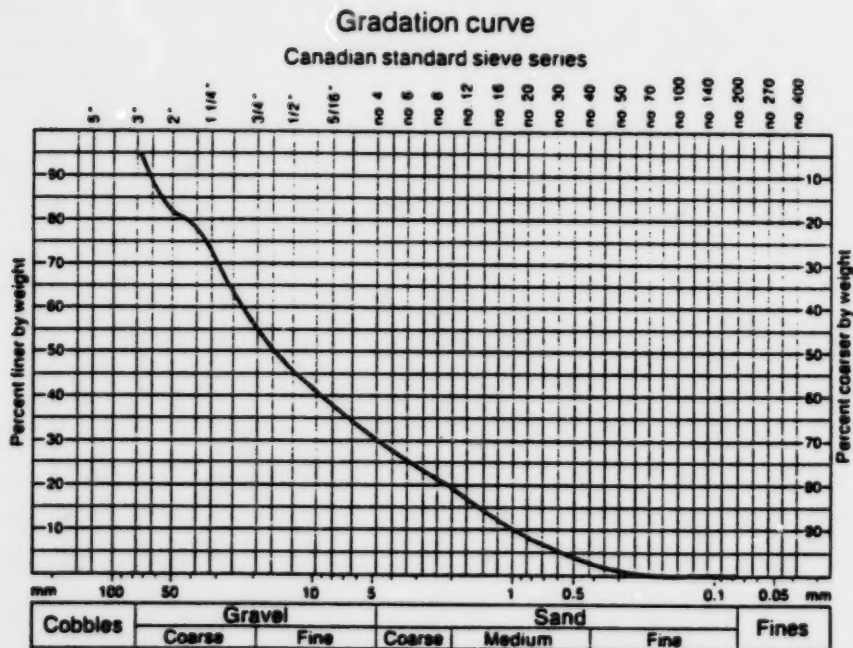
Approximately 3.5m of dirty gravel with abundant till clasts. The largest till clast is 1m and 25cm clasts are abundant.

Pit Location: LSD16 Sec26 Tp88 R9 W4M

Pit Description:

Overburden is removed from above a 4m face of well graded, dirty gravelly sand. Maximum clast size is 40cm but 90% of the material is smaller than 4mm. Clasts are subangular to subrounded and consist primarily of igneous rocks from the Canadian Shield with some quartzite. Till clasts are present but less abundant than in the pit described above. Further north in the pit total depth of granular material is approximately 11m but is primarily sand interbedded with large blocks of till.

Gradation: 3.8% cobbles 65.8% gravel
30.1% sand 0.3% fines

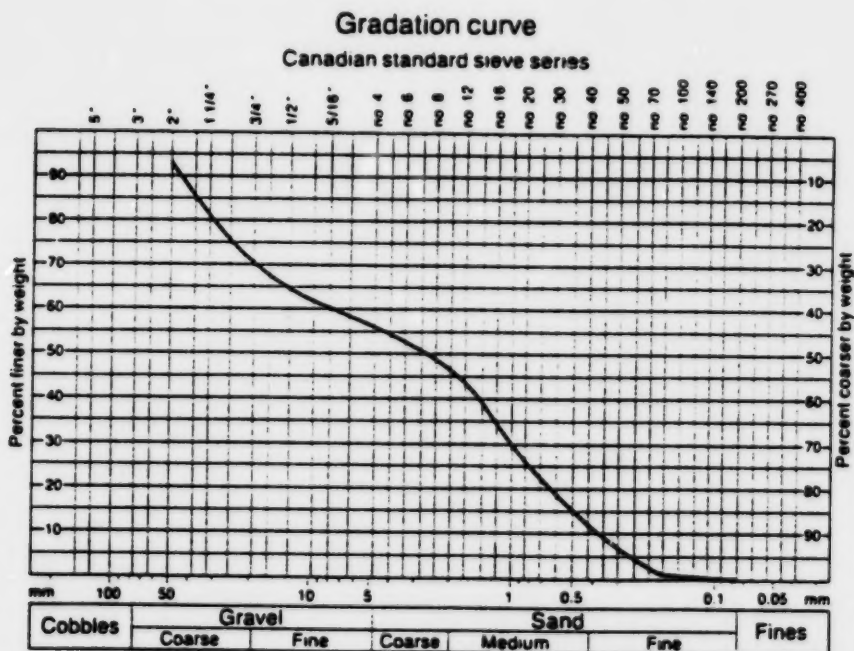


Pit Location: LSD1 Sec35 Tp88 R9 W4M

Pit Description:

Primarily fine sand with minor, local lenses of aggregate draped to the west over till. Sand is fine, clean and with iron stain common on bedding planes. Clay-rich silt or sand to 2m commonly is overburden. Maximum clast size is 1m but 85% of the material is finer than 4mm. Clasts are subangular to subrounded and consist primarily of igneous rocks from the Canadian Shield plus sandstone and quartzite. The sample was taken from a lens of aggregate.

Gradation: 0% cobbles 43.4% gravel
56.1% sand 0.5% fines

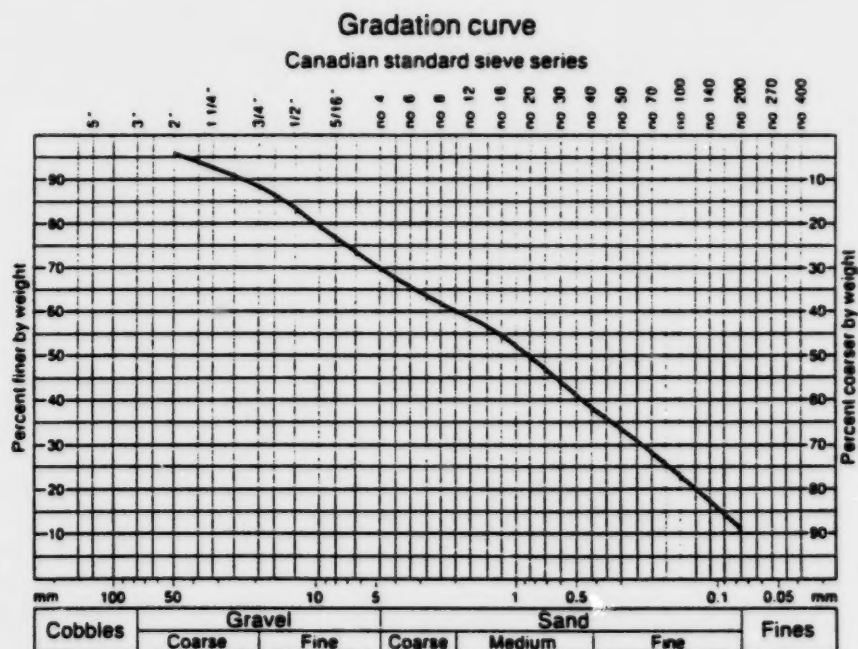


Pit Location: LSD8 Sec35 Tp88 R9 W4M

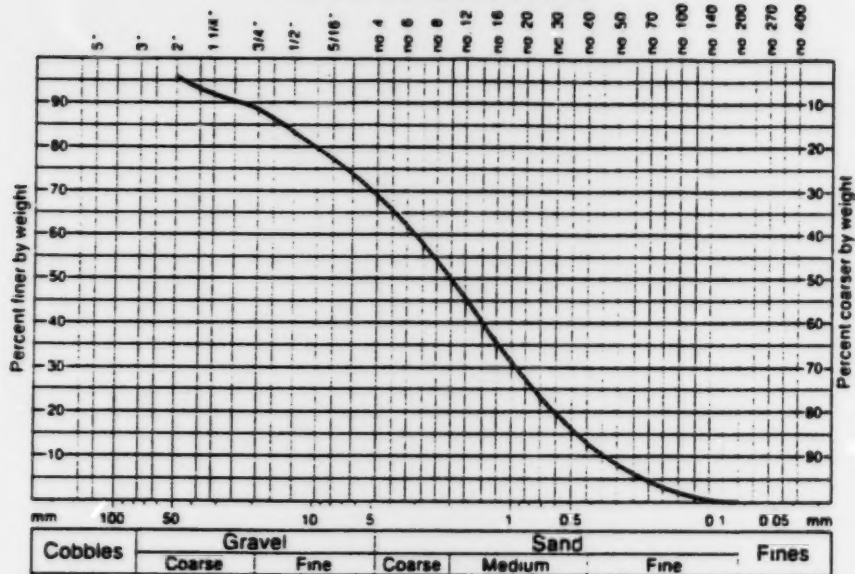
Pit Description:

Test pit 1.75m deep in very dirty gravelly sand with abundant clay clasts overlying fine to medium grained, clean, iron stained, thin bedded sand. The clasts in the upper 1.25m are subangular to subrounded, compose 5% of the material and consist of igneous rocks from the Canadian Shield plus quartzite. A few oil sand clasts also are present. Results of a northward traverse with the EM31 indicate that the material probably is a continuation of very dirty gravelly sand.

Gradation:	0% cobbles	30.9% gravel	wet sieve
	48.1% sand	21.0% fines	
	0% cobbles	30.9% gravel	dry sieve
	68.3% sand	0.8% fines	



Gradation curve
Canadian standard sieve series



DEPOSIT 8

LOCATION: LSD9,14,15,16 Sec19 Tp88 R8 W4M
 LSD5,12,13,14,16 Sec20 Tp88 R8 W4M
 LSD10,12,13,14,15,16 Sec21 Tp88 R8 W4M
 LSD14,15 Sec22 Tp88 R8 W4M
 LSD2,3,6,7 Sec28 Tp88 R8 W4M
 LSD2,3,4,5,6 Sec29 Tp88 R8 W4M

No. of associated pits/sites: 10

No. of samples analysed: 10

DEPOSIT DESCRIPTION:

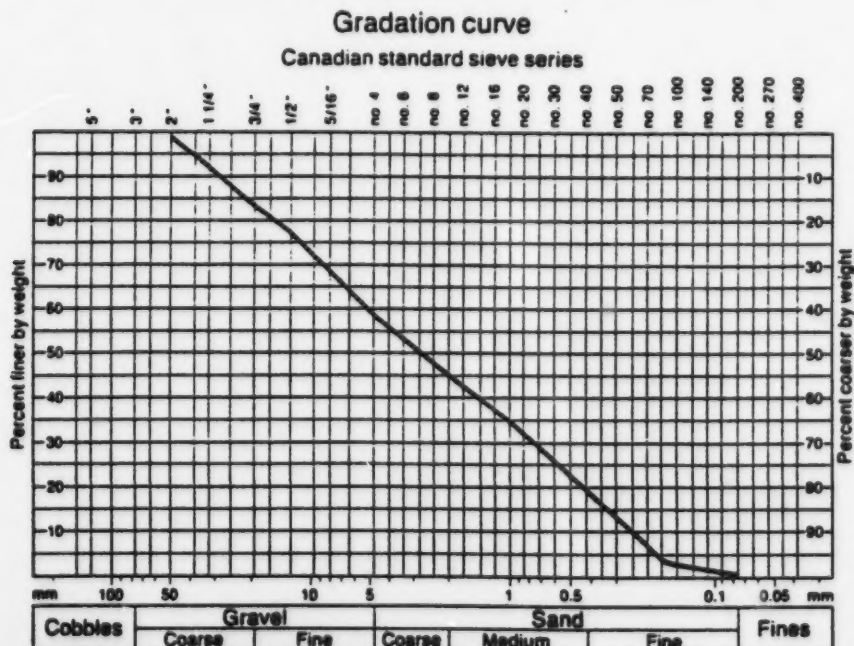
Dirty gravelly sand 1-1.5m thick below till overburden to 1m. Clasts compose less than 10% of the material and are primarily igneous rock from the Canadian Shield with some quartzite. Soft shale and ironstone clasts are common and crumbly schist clasts also are present.

Pit Location: LSD9 Sec19 Tp88 R8 W4M

Pit Description:

Very shallow pit of dirty gravelly sand exposed over till at the west edge of the Twilite Drive-In Theatre. Overburden is less than 15cm. Clasts compose 10% of the material and are subangular to subrounded igneous rocks from the Canadian Shield with quartzite. Limestone and ironstone also are present.

Gradation: 0% cobbles 41.5% gravel
 57.2% sand 1.4% fines

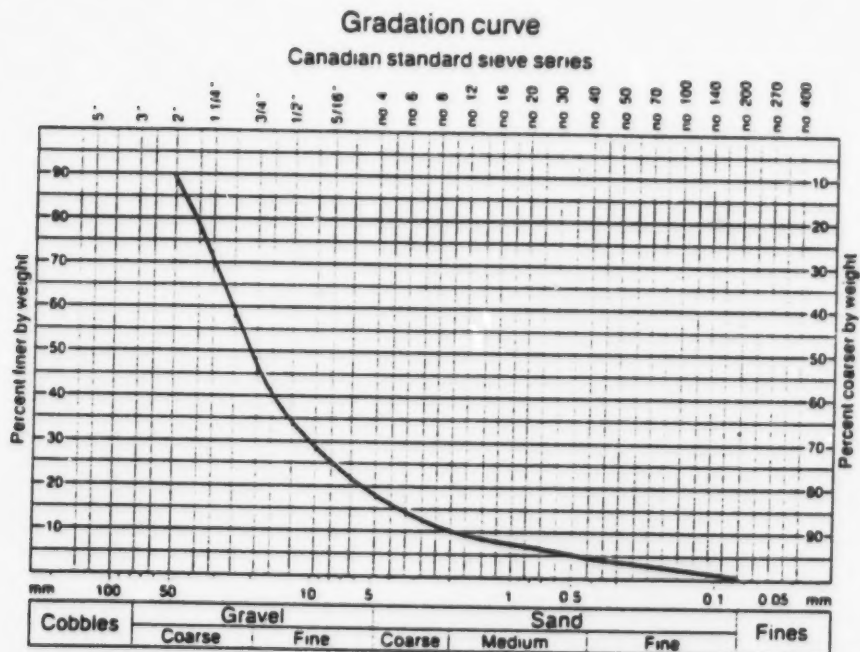


Pit Location: LSD16 Sec19 Tp88 R8 W4M

Pit Description:

Abandoned pit, to 1.5m deep with standing water in deepest spots, containing very dirty, gravelly sand to till. Subangular to subrounded clasts compose 5% of the material and are primarily igneous rocks from the Canadian Shield plus quartzite and ironstone.

Gradation: 0% cobbles 82.4% gravel
 16.5% sand 1.2% fines

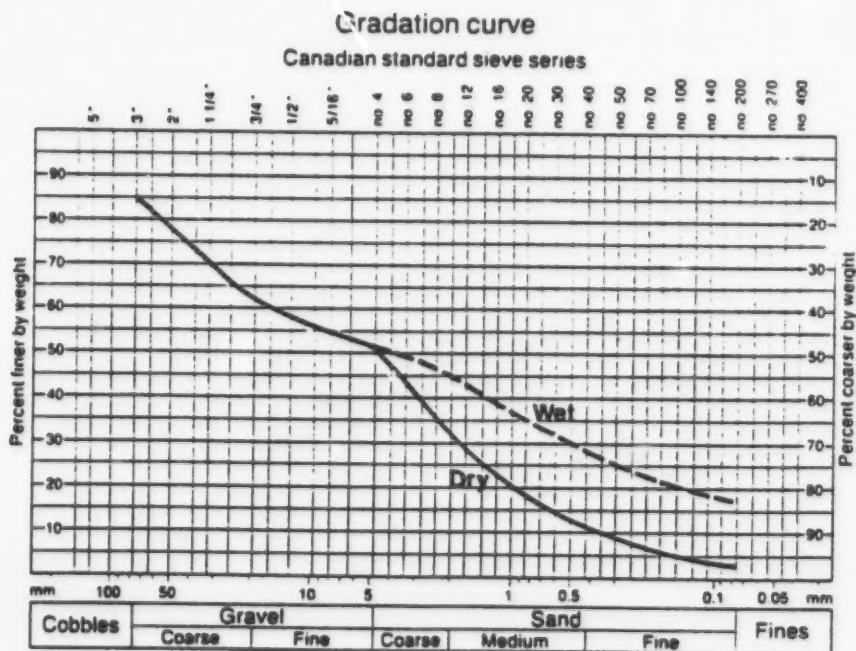


Pit Location: LSD13 Sec20 Tp88 R8 W4M

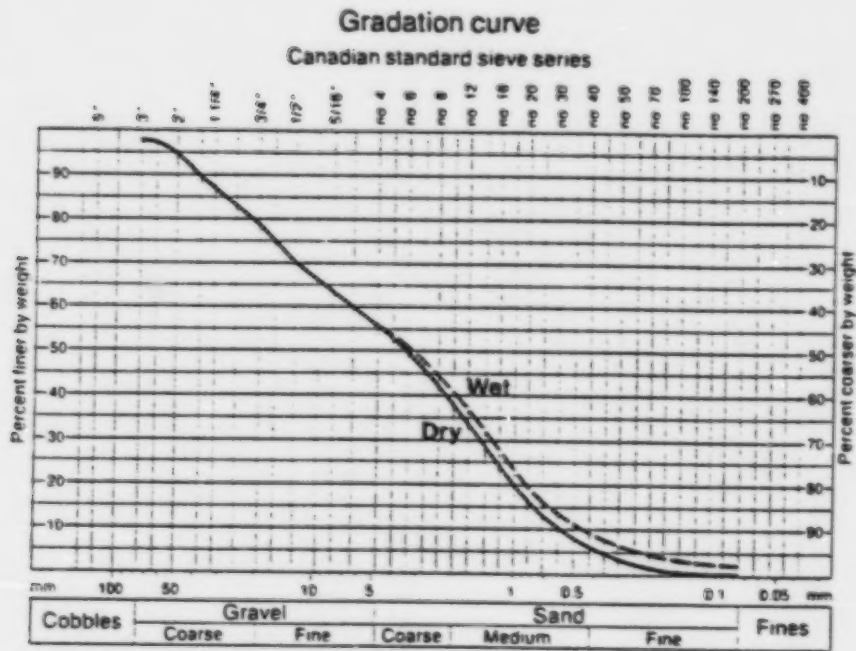
Pit Description:

Exposure of 0.4m of dirty gravelly sand below 0.4m of sandy till overburden. Maximum clast size is 35cm and clasts compose 7% of the poorly graded material. Subangular to subrounded clasts consist of igneous rocks from the Canadian Shield, limestone and quartzite. It is unlikely that the overburden could be separated successfully from the underlying material. The combined material probably could be used successfully for road base if the large clasts are crushed. The first sample is from the overburden and the second sample is from the gravelly sand.

Gradation:	14.2% cobbles	33.3% gravel	dry sieve
	48.8% sand	3.7% fines	
Sample 1	14.2% cobbles	33.3% gravel	wet sieve
	34.9% sand	17.5% fines	
Sample 2	2.7% cobbles	40.4% gravel	dry sieve
	56.4% sand	0.5% fines	
	2.7% cobbles	40.4% gravel	wet sieve
	54.8% sand	2.1% fine	



Sample 1



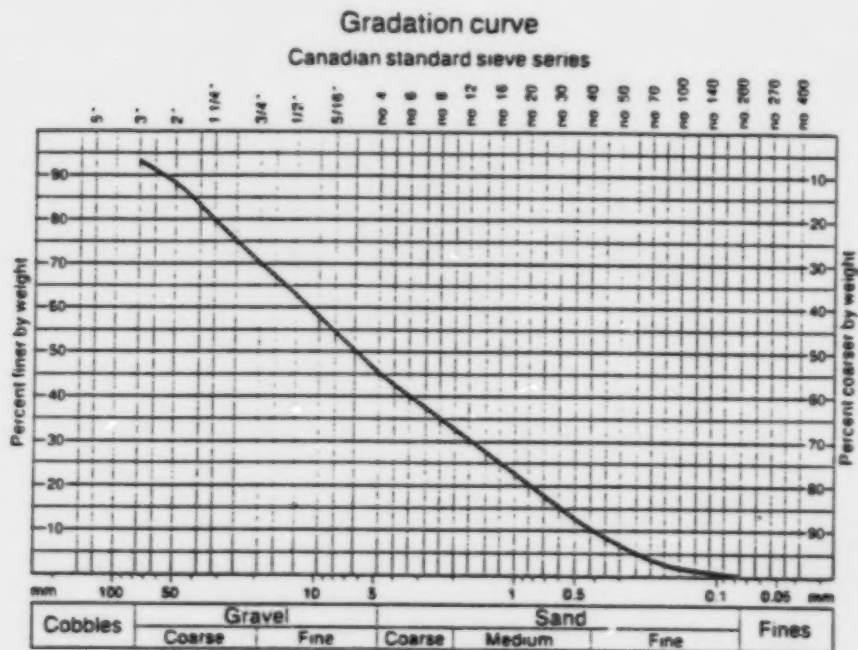
Sample 2

Pit Location: LSD16 Sec20 Tp88 R8 W4M

Pit Description:

Exposure of 1.3m of dirty, gravelly, medium to coarse sand below 40cm of till. Clasts compose 5% of the material and consist of igneous rocks from the Canadian Shield, limestone, quartzite and ironstone.

Gradation: 6.6% cobbles 47.9% gravel
44.6% sand 0.9% fines

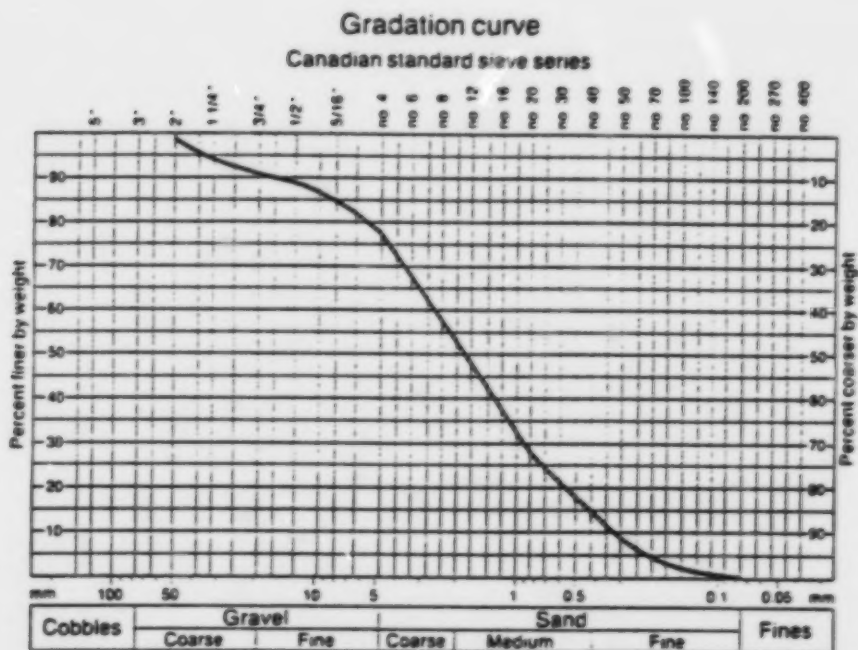


Pit Location: LSD14 Sec21 Tp88 R8 W4M

Pit Description:

Exposure of 1.75m of clean, medium to coarse sand with 3% clasts to 10cm. Clasts are granite, limestone, quartzite and ironstone. A few thin stringers of clean to clayey silt are present. Till is the pit floor.

Gradation: 0% cobbles 22.9% gravel
76.3% sand 0.9% fines



Site Location: LSD16 Sec21 Tp88 R8 W4M

Site Description:

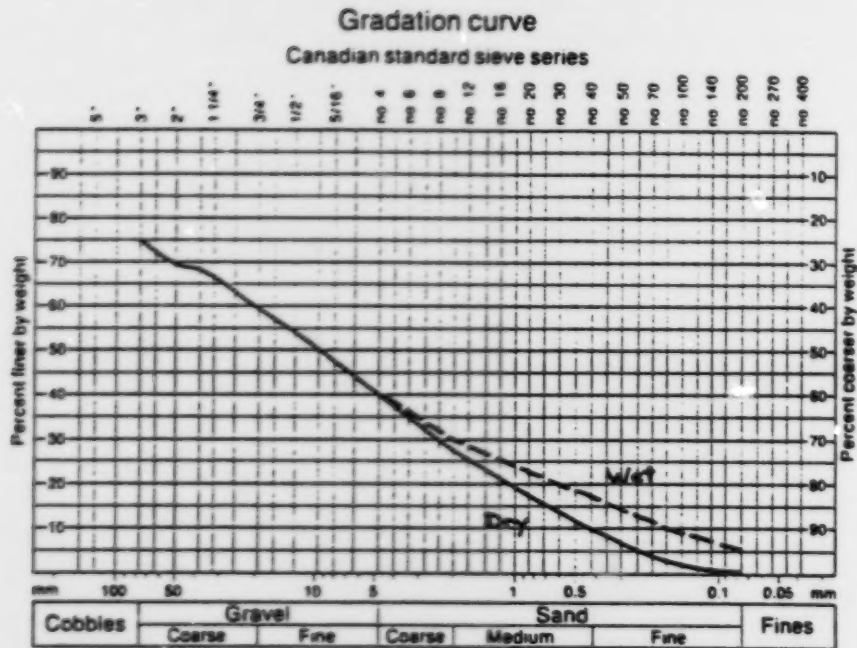
Roadcut 1.5m high of bouldery, very dirty sand.

Pit Location: LSD16 Sec21 Tp88 R8 W4M

Pit Description:

Exposure of 1.25m of dirty, poorly sorted, gravelly sand. Maximum clast size is 40cm. Subangular to subrounded clasts compose 10% of the material and consist of igneous rocks from the Canadian Shield, limestone, quartzite, abundant ironstone and a few clay clasts. Schist clasts commonly are severely weathered to incompetent masses of biotite.

Gradation:	24.4% cobbles	35.4% gravel	wet sieve
	34.3% sand	5.9% fines	
	24.4% cobbles	35.4% gravel	dry sieve
	39.1% sand	1.1% fines	

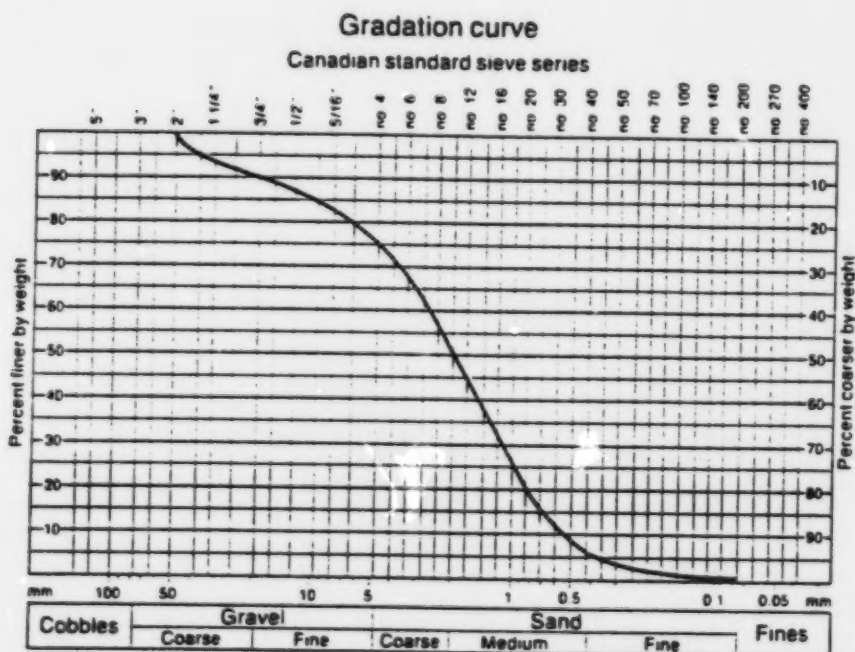


Site Location: LSD15 Sec22 Tp8B R8 W4M

Site Description:

Exposure 1.5m high of bouldery, coarse to medium, dirty sand beneath 15cm of overburden and overlying till. Subangular to subrounded clasts compose only 5% of the material and consist primarily of igneous rocks from the Canadian Shield and quartzite. This veneer of dirty, gravelly sand is present locally.

Gradation: 0% cobbles 24.8% gravel
74.4% sand 0.8% fines

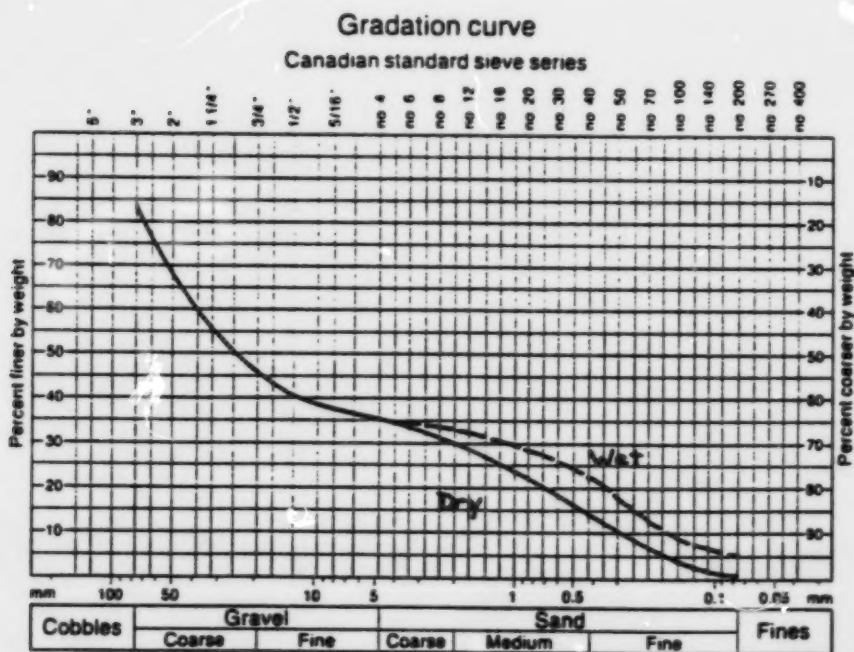


Pit Location: LSD3 Sec28 Tp88 R8 W4M

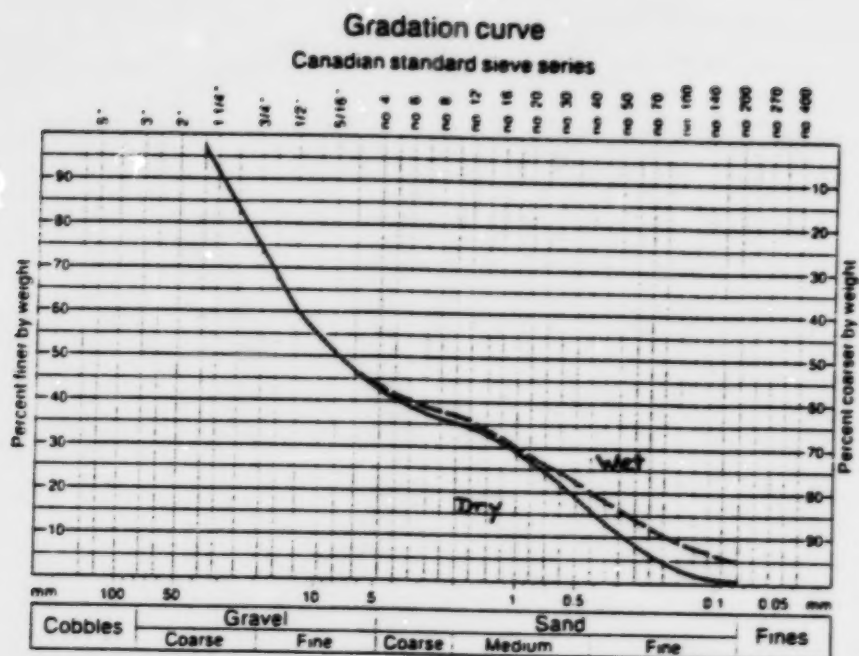
Pit Description:

Exposure of dirty gravelly sand to 3.5m high below 15cm to 1.25m till overburden. Maximum clast size is 1m and clasts to 25cm are common. Material smaller than 4mm composes 85 to 95% of the exposure. Clasts are primarily igneous rocks from the Canadian Shield plus quartzite. Soft shale clasts that disintegrate easily and ironstone clasts are common. The pit appears to be depleted. Results of two traverses with the EM31 approximately 50m north of the exposure in eastward and westward directions indicate that the material is till.

Gradation:	16.1% cobbles	47.5% gravel	wet sieve
	29.7% sand	6.6% fines	
Sample 1	16.1% cobbles	47.5% gravel	dry sieve
	35.5% sand	1.0% fines	
Sample 2	0% cobbles	57.3% gravel	wet sieve
	36.3% sand	6.4% fines	
	0% cobbles	57.3% gravel	dry sieve
	41.1% sand	1.6% fines	



Sample 1



Site Location: LSD3 Sec29 Tp88 R8 W4M

Site Description:

Fine, clean, iron stained sand.

DEPOSIT 9

LOCATION: LSD9,15,16 Sec23 Tp88 R8 W4M
LSD7,10,11 Sec24 Tp88 R8 W4M
LSD4 Sec26 Tp88 R8 W4M
LSD1,8 Sec27 Tp88 R8 W4M

No. of associated pits/sites: 3

No. of samples analysed: None

DEPOSIT DESCRIPTION:

Clean, fine to medium grained sand with less than 5% clasts.

Site Location: LSD9 Sec23 Tp88 R8 W4M

Site Description:

Exposure 1.5m high of clean, fine sand with less than 5% clasts to 2.5cm overlying till.

Site Location: LSD11 Sec24 Tp88 R8 W4M

Site Description:

Borrow pit with 3.5m exposure of fine to medium grained, slightly dirty sand with less than 1% clasts.

Site Location: LSD4 Sec26 Tp88 R8 W4M

Site Description:

Roadcut exposure of 75cm of fine to medium, clean sand with 0.5% clasts to 2.5cm.

DEPOSIT 10

LOCATION: LSD5,12 Sec2 Tp89 R10 W4M
LSD8,9 Sec3 Tp89 R10 W4M

No. of associated pits/sites: 1

No. of samples analysed: None

DEPOSIT DESCRIPTION:

See site description below.

Site Location: LSD8 Sec3 Tp89 R10 W4M

Site Description:

Point bar approximately 2m high in the Athabasca River that has been worked for gold. Aggregate consists of subrounded clasts to 10cm with fine sand and some angular limestone slabs. Because of evidence of placer mining throughout the bar and on the shoreline to the southwest the material was not sampled. Analyses would be biased in favor of coarser clasts. Mollard (1974) Site 77A.

PITS/SITES OUTSIDE DEPOSIT BOUNDARIES

Site Location: LSD4 Sec14 Tp87 R7 W4M

Site Description:

Helicopter flyover. Appears to be clayey silt.

Site Location: LSD6 Sec27 Tp88 R7 W4M

Site Description:

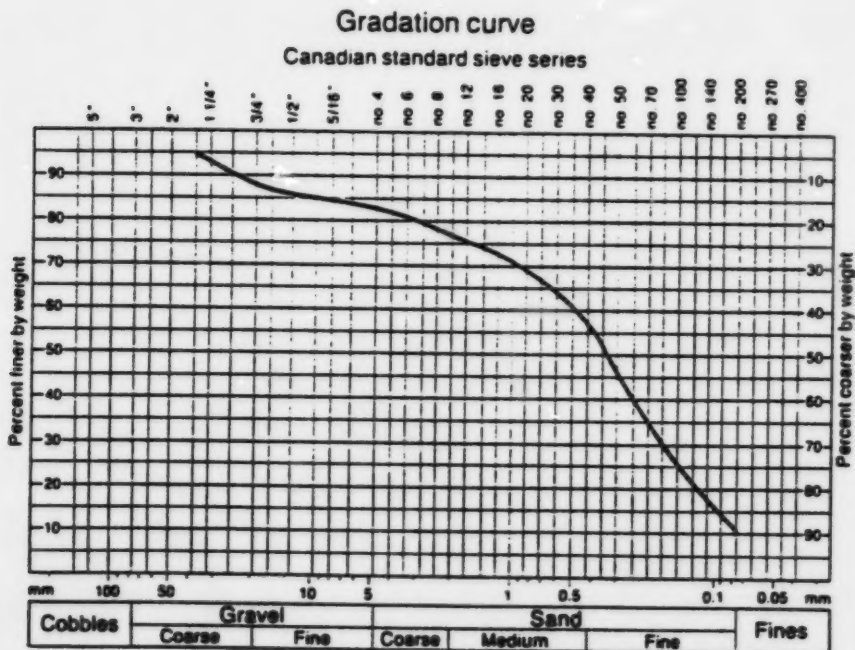
Slightly clayey silt to fine sand.

Pit Location: LSD1 Sec28 Tp88 R7 W4M

Pit Description:

Exposure 6.4m high of extremely dirty, poorly graded gravelly sand with high concentrations of ironstone and clay clasts. Overburden 15cm. Maximum clast size is 40cm with 95% less than 5cm. Clasts are primarily angular to subrounded igneous rocks from the Canadian Shield with some quartzite and a few oil sand pebbles.

Gradation: 0% cobbles 17.2% gravel
 71.9% sand 10.9% fines



Site Location: LSD13 Sec28 Tp88 R7 W4M

Site Description:

Large bar at confluence of the Clearwater and Christina Rivers consists of clean, fine to medium grained sand with 5% subrounded clasts to 15cm.

Site Location: LSD16 Sec14 Tp88 R8 W4M

Site Description:

Very clayey silt with less than 5% clasts to 15cm.

Site Location: LSD14 Sec19 Tp88 R8 W4M

Site Description:

Hill of clayey silt overlain by 25 to 30cm of fine, clean sand containing a few clay and silt clasts to 1cm. Locally the upper sand layer is 10 to 15cm thick and contains 5% clasts.

Site Location: LSD15 Sec20 Tp88 R8 W4M

Site Description:

Extensive area of till over gravelly sand.

Site Location: LSD6 Sec22 Tp88 R8 W4M

Site Description:

Slightly clayey silt to fine sand with 2% clasts to 15cm.

Site Location: LSD8 Sec22 Tp88 R8 W4M

Site Description:

Slightly clayey silt to fine sand with 2% clasts to 15cm.

Site Location: LSD11 Sec22 Tp88 R8 W4M

Site Description:

Slightly clayey silt to fine sand with 2% clasts to 15cm.

Site Location: LSD4 Sec23 Tp88 R8 W4M

Site Description:

Clayey silt with 5% clasts to 15cm.

Site Location: LSD11 Sec29 Tp88 R8M W4M

Site Description:

Roadcut exposure of thin veneer of clean sand with 1% clasts to 5cm.

Site Location: LSD7 Sec30 Tp88 R8 W4M

Site Description:

Bouldery, sandy till to very dirty gravel and sand in three, low linear features. Clasts to 50cm compose approximately 2%, 25 to 50cm approximately 5% and 15 to 25cm approximately 10% of the material. Clasts of shale are common. Clasts would have to be crushed to use this material but the high fines content is a detriment to use.

Site Location: LSD10 Sec31 Tp88 R8 W4M

Site Description:

Dark olive, silty clay to clayey silt.

Site Location: LSD7 Sec32 Tp88 R8 W4M

Site Description:

Exposure 1.5m deep of gray, clayey silt in newly cleared river bottom field.

Site Location: LSD14 Sec35 Tp88 R8 W4M

Site Description:

Limestone colluvium over limestone bedrock.

Site Location: LSD3 Sec2 Tp88 R9 W4M

Site Description:

Logged area underlain by clayey silt.

Site Location: LSD16 Sec15 Tp89 R9 W4M

Site Description:

Interbedded clean sand and till.

Site Location: LSD4 Sec19 Tp88 R9 W4M

Site Description:

Exposure in creek bank of clean silt to fine sand.

Site Location: LSD8 Sec19 Tp88 R9 W4M

Site Description:

Very clayey silt.

Site Location: LSD8 Sec21 Tp88 R9 W4M

Site Description:

Exposure of till underlain by silt underlain by bedrock.

Site Location: LSD11 Sec23 Tp88 R9 W4M

Site Description:

A low ridge of sandy till with boulders to 1m+. No clasts are present smaller than 10-15cm.

Site Location: LSD9 Sec25 Tp88 R9 W4M

Site Description:

Roadcuts of the east/west and northwest oriented roads of Keyano College heavy equipment operator training grounds all contain till.

Pit Location: LSD12 Sec25 Tp88 R9 W4M

Pit Description:

Approximately 7m of fine, clean cross-bedded sand is exposed below 1m of till overburden in a Keyano College heavy equipment operator training pit. A lens of silt 15m long and 3m high cuts through the face. An instructor from the college confirms that the height of land covered by the training area is composed primarily of till and that granular material is present only at the edges.

Site Location: LSD13 Sec28 Tp88 R9 W4M

Site Description:

Large expanse of silt.

Site Location: LSD16 Sec30 Tp88 R9 W4M

Site Description:

Slightly sandy clay

Site Location: LSD11 Sec33 Tp88 R9 W4M

Site Description:

Large expanse of silt with only rare clasts.

Site Location: LSD1 Sec32 Tp88 R9 W4M

Site Description:

Till with no indication of pockets of aggregate anywhere.

Site Location: LSD2 Sec36 Tp88 R9 W4M

Site Description:

Clean, iron stained, fine to medium sand with clast content less than 1%. Maximum clast size is 15cm but most are less than 5cm.

Site Location: LSD8 Sec13 Tp88 R10 W4M

Site Description:

Slightly clayey silt to fine sand.

Site Location: LSD12 Sec24 Tp88 R10 W4M

Site Description:

Sandy clay.

Site Location: LSD14 Sec24 Tp88 R10 W4M

Site Description:

Clean, fine sand.

Site Location: LSD6 Sec36 Tp88 R10 W4M

Site Description:

Helicopter flyover. Pine cover, likely over sand.

Site Location: LSD11 Sec30 Tp89 R7 W4M

Site Description:

Clean, fine to medium grained sand. Vegetation is mainly spruce and poplar.

Site Location: LSD5 Sec20 Tp89 R8 W4M

Site Description:

Ridge 3m high covered with spruce and poplar forest on clayey silt.

Site Location: LSD6 Sec21 Tp89 R8 W4M

Site Description:

Helicopter flyover. Spruce and poplar forest. Probably underlain with clayey silt or till.

Site Location: LSD7 Sec24 Tp89 R8 W4M

Site Description:

Clayey silt below poplar with minor spruce.

Site Location: LSD1 Sec28 Tp89 R8 W4M

Site Description:

Helicopter flyover. Forest is spruce and poplar and probably is underlain with clayey silt or till.

Site Location: LSD4 Sec29 Tp89 R8 W4M

Site Description:

Helicopter flyover. Poplar and spruce forest probably underlain with clayey silt or till.

Site Location: LSD5 Sec29 Tp89 R8 W4M

Site Description:

Large area of fluvially modified till.

Site Location: LSD11 Sec1 Tp89 R9 W4M

Site Description:

River bottom field with dark olive gray to black clay with minor silt.

Site Location: LSD5 Sec2 Tp89 R9 W4M

Site Description:

Cleared area with piles of aggregate material that appear to have been pushed up from depressions. Close examination of the material identifies clasts as large as 50cm and many smaller clasts with freshly broken faces that may be the result of processing in a crusher. The integrity of such material being in place is suspect especially when considered in conjunction with a nearby exposure of material that exposes clasts on its surface but is revealed to be till by digging.

Site Location: LSD13 Sec4 Tp89 R9 W4M

Site Description:

Veneer of silt overlying shale bedrock.

Site Location: LSD4 Sec9 Tp89 R9 W4M

Site Description:

Exposure of 3m of fine sand overlying thin bedded silt and shale bedrock.

Site Location: LSD11 Sec9 Tp89 R9 W4M

Site Description:

Clean silt to fine sand. Mollard (1974) Site 51.

Site Location: LSD13 Sec14 Tp89 R9 W4M

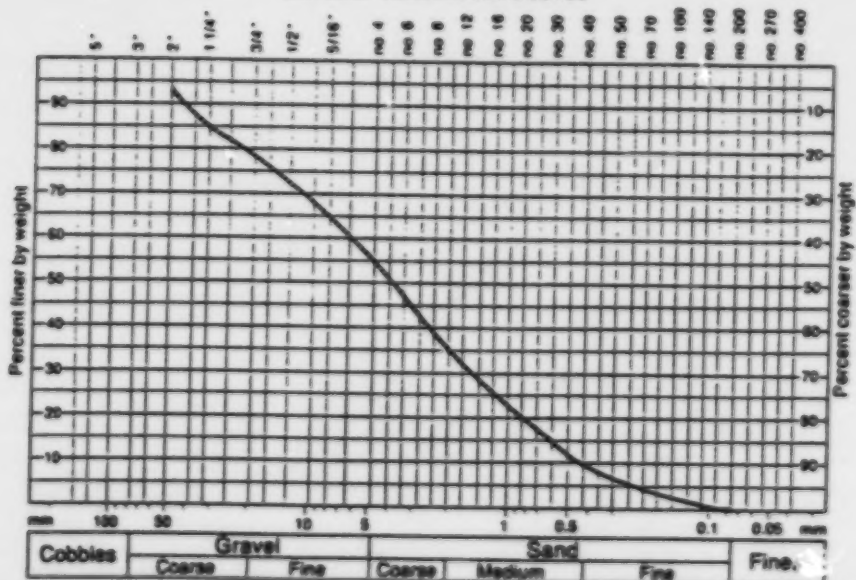
Site Description:

Exposure in borrow pit of 1.5m of very sandy till to extremely dirty, gravelly sand. Maximum clast size is 40cm but 85% of the material is smaller than 4mm. Clasts are primarily igneous rocks from the Canadian Shield plus quartzite.

Gradation: 0% cobbles 44.0% gravel
55.0% sand 1.0% fines

Gradation curve

Canadian standard sieve series



Site Location: LSD14 Sec15 Tp89 R9 W4M

Site Description:

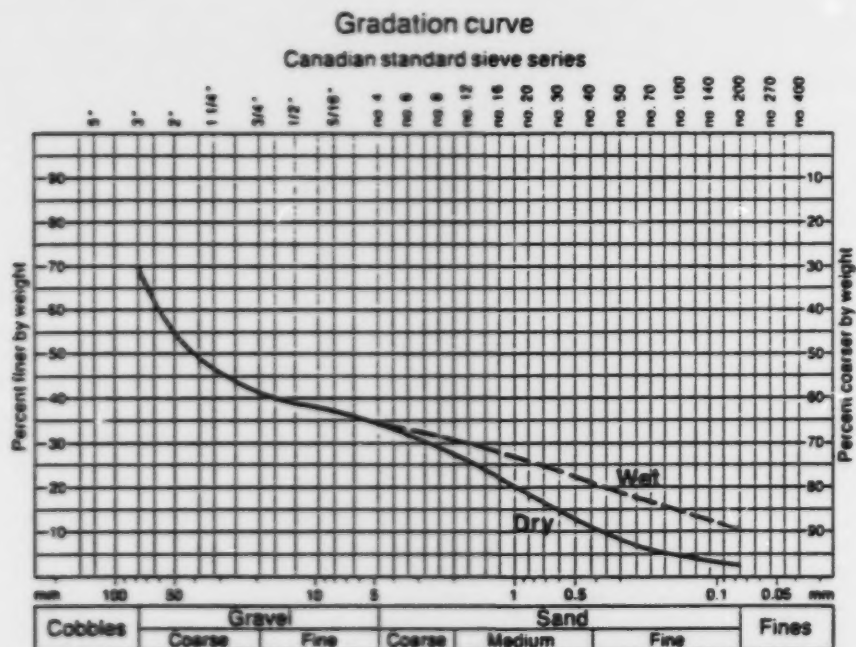
Till.

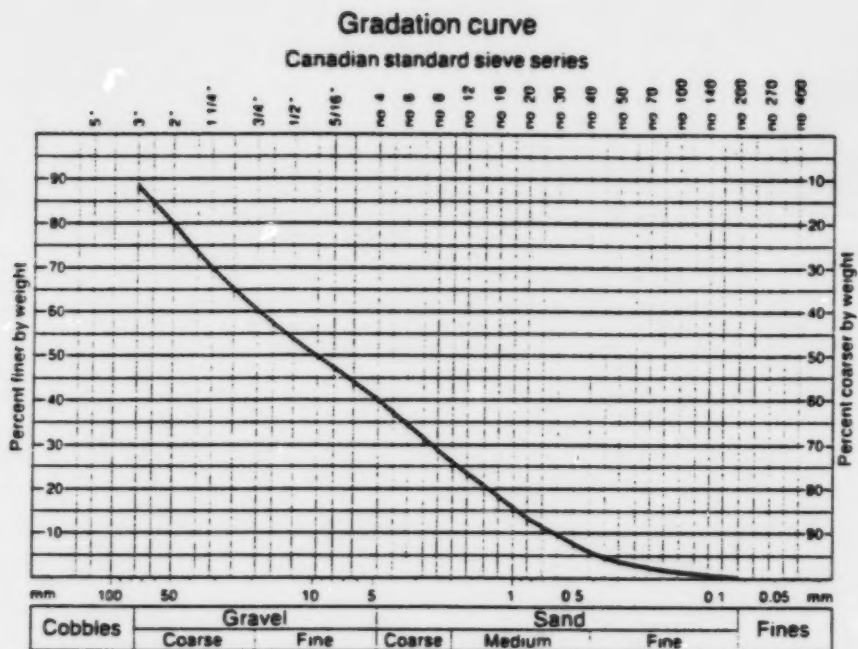
Pit Location: LSD16 Sec15 Tp88 R9 W4M

Pit Description:

Bog area currently being mined for black dirt and intermittently for gravel. Very dirty, bouldery, gravelly sand 40 cm thick overlies 70cm of dirty gravelly sand. The water table is at 110cm and appears to be at the lower contact of the gravelly sand. Clasts to 35cm are in the upper material and clasts to 15cm are in the lower material. Clasts are primarily sub angular to subrounded igneous rocks from the Canadian Shield plus hard and soft sandstone and quartzite. Ironstone and lignite clasts also are present. The veneer of material seems to have been mined from pockets.

Gradation:	30.7% cobbles	34.8% gravel	dry sieve
	30.9% sand	3.6% fines	
	30.7% cobbles	34.8% gravel	wet sieve
	22.6% sand	11.9% fines	
	11.1% cobbles	34.3% gravel	
	53.7% sand	0.9% fines	





Site Location: LSD5 Sec17 Tp89 R9 W4M

Site Description:

Bedded clayey silt underlain by clayey silt with 5% clasts to 30cm.
Mollard (1974) Site 79.

Site Location: LSD1 Sec23 Tp89 R9 W4M

Site Description:

Helicopter flyover. Spruce and poplar forest. Probably underlain
with clayey silt or till.

Site Location: LSD7 Sec24 Tp89 R9 W4M

Site Description:

Clayey silt with minor clasts.

Site Location: LSD7 Sec24 Tp89 R9 W4M

Site Description:

Clayey silt with minor clasts.

Site Location: LSD9 Sec24 Tp89 R9 W4M

Site Description:

Till below spruce and poplar forest.

Site Location: LSD2 Sec25 Tp89 R9 W4M

Site Description:

Helicopter flyover. Primarily pine forest. Probably underlain with
sand.

Site Location: LSD5 Sec26 Tp89 R9 W4M

Site Description:

Helicopter flyover. Spruce and poplar forest. Probably clayey silt
or till below.

Site Location: LSD16 Sec28 Tp89 R9 W4M

Site Description:

Clean, fine to medium grained sand.

Site Location: LSD11 Sec29 Tp89 R9 W4M

Site Description:

River bank with clayey silt overlying Waterways Formation limestone. No clasts are apparent in the point bars. The limestone is a potential road base source.

Site Location: LSD13 Sec30 Tp89 R9 W4M

Site Description:

Sandy till with 2% clasts to 30cm.

Site Location: LSD11 Sec14 Tp89 R10 W4M

Site Description:

Clayey silt.

APPENDIX III

PIT/SITE DESCRIPTIONS FOR MAP AREA 74D/5

Site Location: LSD10 Sec2 Tp84 R11 W4M

Site Description:

Borrow pit with a 3m exposure of clean, fine sand with 2% clasts ranging to 15cm.

Site Location: LSD15 Sec7 Tp84 R10 W4M

Site Description:

Clean, fine to medium grained sand with 1% clasts to 15 cm. Clay balls to 2.5cm also are present.

Site Location: LSD5 Sec13 Tp84 R11 W4M

Site description:

Fine to medium, with minor amounts of coarse, clean sand. Clasts to 10cm form only 3% of the material. Similar material is evident eastward to Hwy 63.

Site Location: LSD10 Sec13 Tp84 R11 W4M

Site Description:

Clean, fine to medium sand with less than 1% clasts to 3cm.

Site Location: LSD15 Sec13 Tp84 R11 W4M

Site Description:

Veneer 15cm thick of slightly clayey, fine to medium grained sand over clayey silt.

Site Location: LSD15 Sec13 Tp84 R11 W4M

Site Description:

Veneer 15cm thick of clean, fine to medium grained sand over till. Sand veneer is slightly thicker at the edges near higher ground.

Site Location: LSD11 Sec14 Tp84 R11 W4M

Site Description:

Clean, fine to medium sand.

Site Location: LSD11 Sec14 Tp84 R11 W4M

Site Description:

Water saturated, clean sand below moss cover.

Site Location: LSD14 Sec14 Tp84 R11 W4M

Site Description:

Clean, fine to medium sand with 5% clasts.

Site Location: LSD16 Sec17 Tp84 R11 W4M

Site Description:

Helicopter flyover. Pine cover with sand at base of uprooted trees.

Site Location: LSD11 Sec18 Tp84 R11 W4M

Site Description:

Till.

Site Location: LSD11 Sec18 Tp84 R11 W4M

Site Description:

River valley bottom consisting of clayey silt.

Site Location: LSD13 Sec18 Tp84 R11 W4M

Site Description:

Till with small pockets of clean, fine to medium sand.

Site Location: LSD11 Sec19 Tp84 R11 W4M

Site Description:

Till.

Site Location: LSD11 Sec20 Tp84 R11 W4M

Site Description:

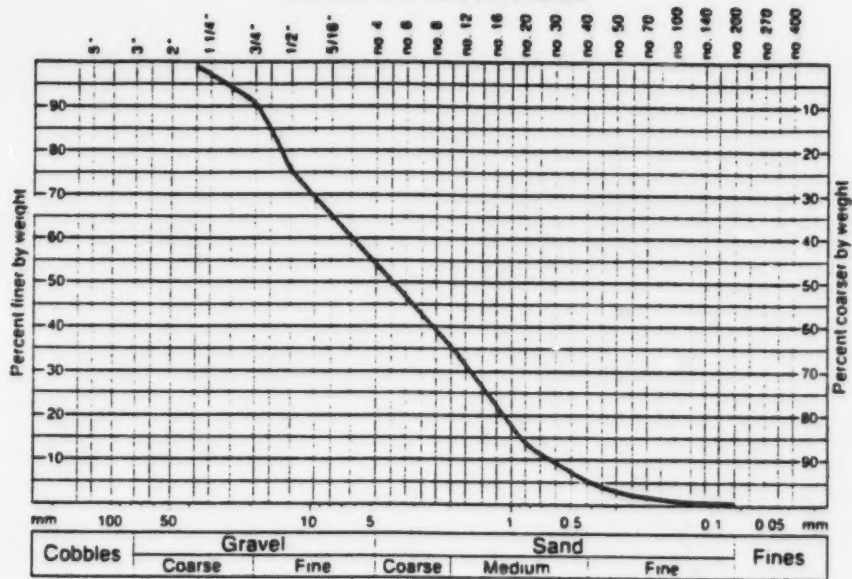
Borrow pit exposes 1.75m of coarse sand to pea gravel overlain by 1+m of clayey silt to till. The aggregate material present ranges from dirty to clean with lenses of silt throughout. Maximum clast size is 15cm and 90% of the material is finer than 4mm. Large clasts commonly are present in beds that contain little or no sand. Clasts are primarily subangular to subrounded igneous rocks from the Canadian Shield with quartzite, clay clasts and ironstone. This aggregate would make good road surface material without crushing. A hole dug an additional 1.3m revealed similar clean material. Bedding is thin and horizontal. Results from traverses with the EM31 indicate that gravel probably does not extend beyond the east, west or south borders of the current pit. To the north, gravel is present in the ditch of the road but overburden beyond the ditch is greater than 5m and the EM31 results are inconclusive.

Gradation:	0% cobbles	45.7% gravel	
	53.8% sand	0.5% fines	
	0% cobbles	66.2% gravel	dry sieve
	33.2% sand	0.6% fines	
	0% cobbles	66.2% sand	wet sieve
	32.7% sand	1.4% fines	

-63-

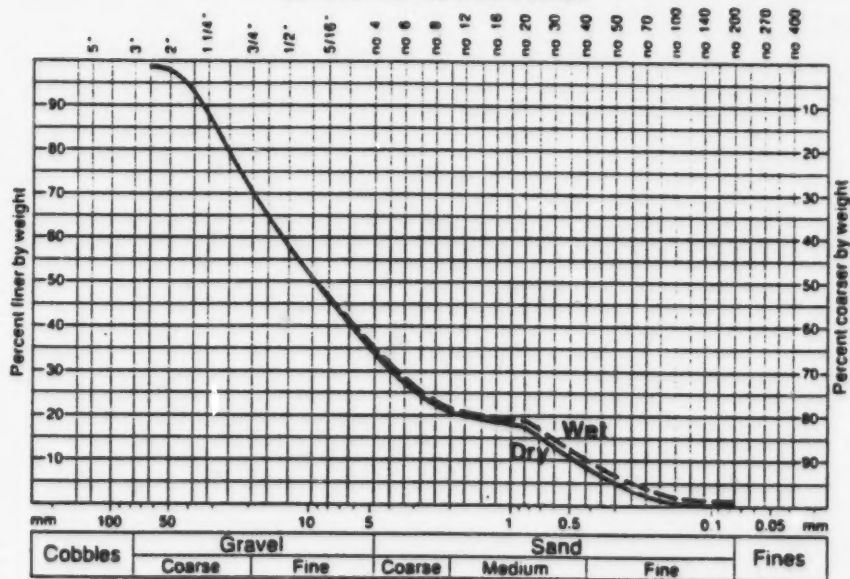
Gradation curve

Canadian standard sieve series



Gradation curve

Canadian standard sieve series



Site Location: LSD13 Sec21 Tp84 R11 W4M

Site Description:

Results of a traverse with the EM31 along a cut line north and south of the road indicate the material is till.

Site Location: LSD8 Sec22 Tp84 R11 W4M

Site Description:

Base of ridge is clean, fine sand grading to clean silt to fine sand near the ridge crest.

Site Location: LSD4 Sec23 Tp84 R11 W4M

Site Description:

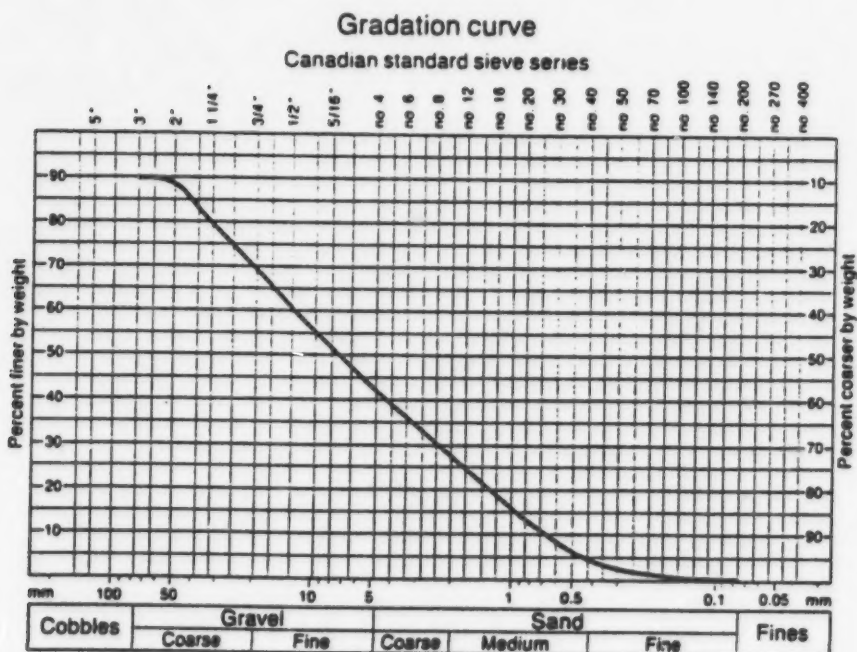
Clean, fine to medium sand with 7% clasts to 10cm.

Site Location: LSD6,11 Sec27 Tp84 R11 W4M

Site Description:

Exposure in a borrow pit of till with small pockets of dirty, gravelly sand with clean sand and clayey silt associated. Clast bearing material is less than 1%. Maximum clast size is 30cm. Clasts are primarily igneous rocks from the Canadian Shield with quartzite, clay clasts and ironstone. Results of eastward and northward traverses through and beyond the current outline of the pit with the EM31 indicate that the material is till.

Gradation 8.1% cobbles 48.9% gravel
 42.6% sand 0.4% fines



Site Location: LSD7 Sec27 Tp84 R11 W4M

Site Description:

Till present at the top of the ridge grades into clayey silt downslope and continues into sand with less than 2% clasts.

Site Location: LSD7 Sec27 Tp84 R11 W4M

Site Description:

A dirty gravel pocket is present at the base of the north ditch but results of a traverse with the EM31 indicate the material is till.

Site Location: LSD2 Sec28 Tp84 R11 W4M

Site Description:

Results of a traverse with the EM31 along a cut line north and south of the road indicate the material is till eventhough numerous clasts are present at the surface at the start of the north traverse.

Site Location: LSD4 Sec31 Tp84 R10 W4M

Site Description:

River valley bottom consisiting of clayey silt.

Site Location: LSD2 Sec36 Tp84 R11 W4M

Site Description:

Clayey silt with less than 1% clasts.

Site Location: LSD2 Sec36 Tp84 R11 W4M

Site Description:

Till overlying dark olive black shale in the south bank of the Hangingsstone River. No evidence of aggregate material at the base of the valley or any section of the valley wall.

Site Location: LSD4 Sec36 Tp84 R11 W4M

Site Description:

Clayey silt.

APPENDIX IV

PIT/SITE DESCRIPTIONS FOR MAP AREA 74D/4

DEPOSIT 1

LOCATION: LSD10,11,14,15,16 Sec34 Tp83 R11 W4M

No. of associated pits/sites: 1

No. of samples analysed: 1

DEPOSIT DESCRIPTION:

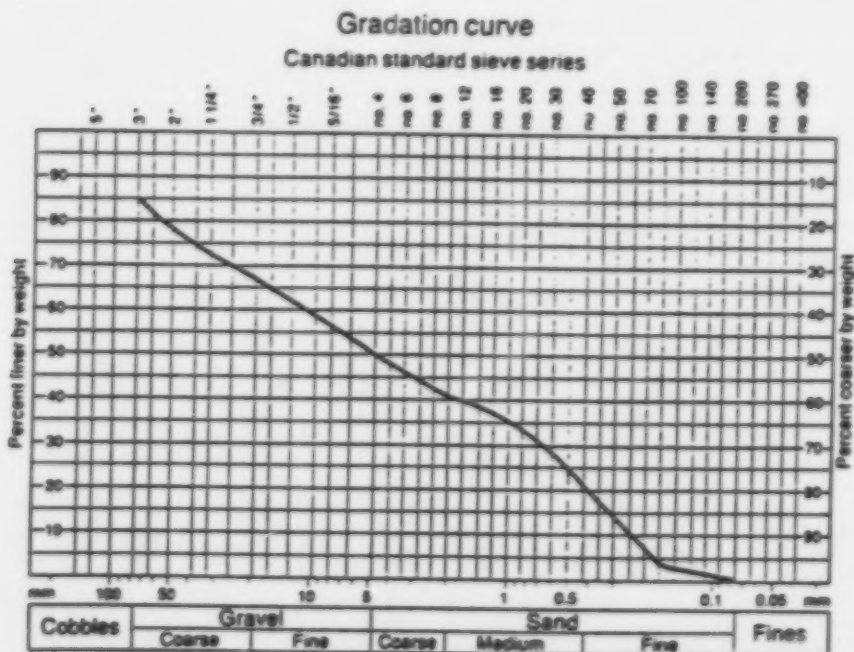
See site description below.

Pit Location: LSD15 Sec34 Tp83 R11 W4M

Pit Description:

Approximately 3m of material is exposed below a 60cm veneer of bouldery, clayey silt. The first 1m below the overburden contact contains clasts to 25cm but most clasts are 5-10cm. Clasts are subangular to subrounded igneous rocks from the Canadian Shield plus hard sandstone, quartzite and ironstone. Maximum clast content in this lens is 5%. The remainder of the pit is clean, fine sand with 0.5% clasts.

Gradation: 14.1% cobbles 35.6% gravel
49.5% sand 0.8% fines



DEPOSIT 2

LOCATION: LSD7,8,9,10,15,16 Sec33 Tp83 R11 W4M
LSD2 Sec4 Tp84 R11 W4M

No. of associated pits/sites: 1

No. of samples analysed: None

DEPOSIT DESCRIPTION:

See site description below.

Site Location: LSD16 Sec33 Tp83 R11 W4M

Site Description:

Upper 4cm is clean, medium to coarse grained sand with 1% clasts to 10cm. Material below is slightly dirty, medium grained sand with no clasts.

DEPOSIT 3

LOCATION: LSD1 Sec33 Tp83 R11 W4M

No. of associated pits/sites: 1

No. of samples analysed: 2

DEPOSIT DESCRIPTION:

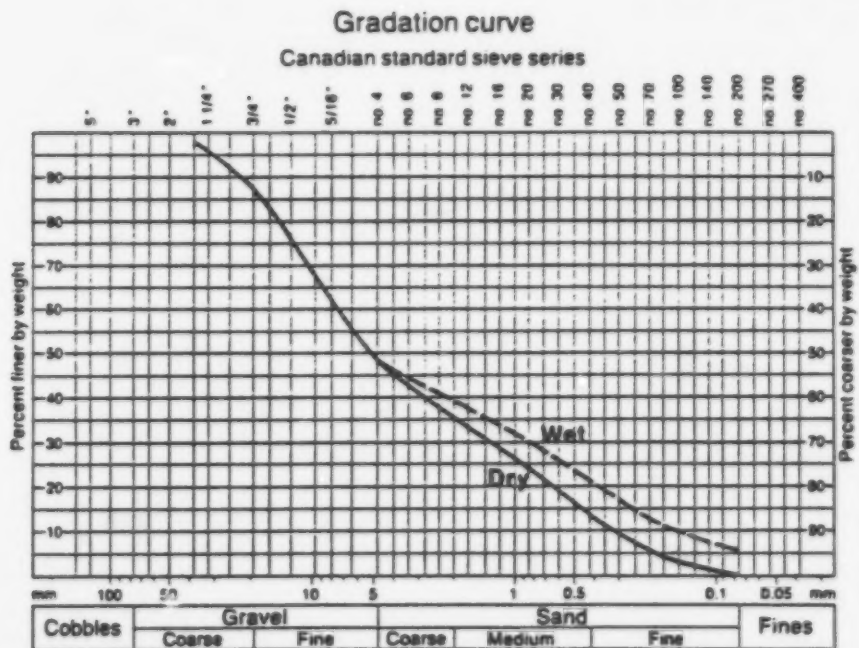
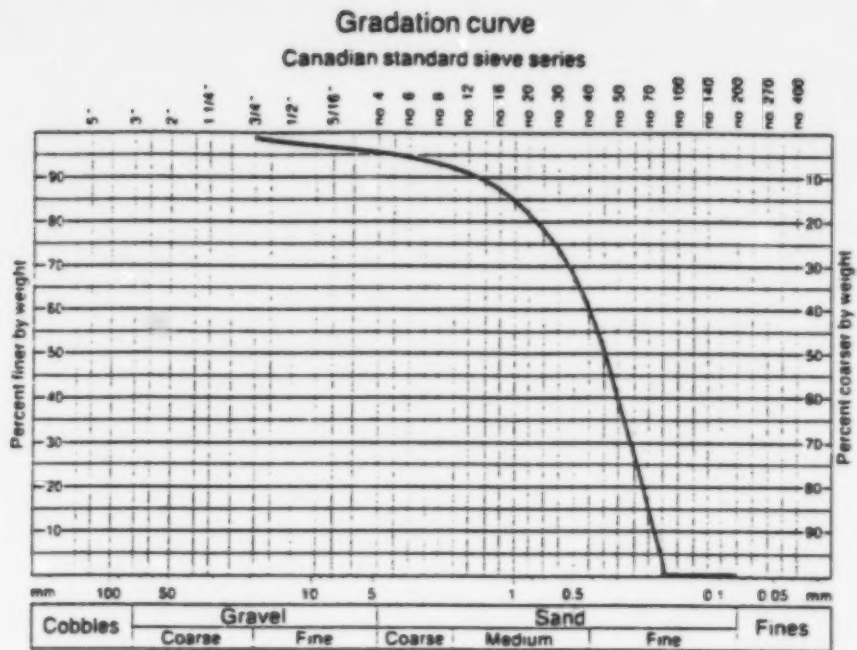
See pit description below.

Pit Location: LSD1 Sec33 Tp83 R11 W4M

Pit Description:

Exposure of 5.25m of clean, fine to medium grained sand with clasts to 1.5m less than 1%. Upper 50cm commonly is clayey silt with a few clasts. At various locations this upper material is underlain by a 25cm bed of dirty, coarse sand, pea gravel and clasts to 5cm. The few clasts in the material are primarily igneous rocks from the Canadian Shield with quartzite. In the centre of the pit is a large pile of clasts that seem to have been screened from the sand. These clasts could be crushed for aggregate.

Gradation:	0% cobbles	4.3% gravel	
	95.2% sand	0.4% fines	
	0% cobbles	51.4% gravel	dry sieve
	46.9% sand	1.6% fines	
	0% cobbles	51.4% gravel	wet sieve
	42.4% sand	6.1% fines	



DEPOSIT 4

LOCATION: LSD8.9 Sec29 Tp83 R11 W4M

No. of associated pits/sites: 1

No. of samples analysed: None

DEPOSIT DESCRIPTION:

See pit description below.

Pit Location: LSD7 Sec29 Tp83 R11 W4M

Pit Description:

Exposure 4.5m high of 50cm of clayey silt with a few clasts underlain by a discontinuous layer of dirty, gravelly sand then clean, fine to medium grained sand with only scattered clasts to 5cm.

DEPOSIT 5

LOCATION: LSD1,2,3,6,7,8,9,10,11,14,15,16 Sec7 Tp83 R11 W4M
LSD1,8 Sec18 Tp83 R11 W4M

No. of associated pits/sites: 3

No. of samples analysed: 2

DEPOSIT DESCRIPTION:

Interbeds of fine, clean sand with dirty, poorly graded gravelly sand. Clasts at less than 35% and are primarily subangular to subrounded igneous rocks from the Canadian Shield with some hard sandstone and quartzite.

Pit Location: LSD2 Sec7 Tp83 R11 W4M

Pit Description:

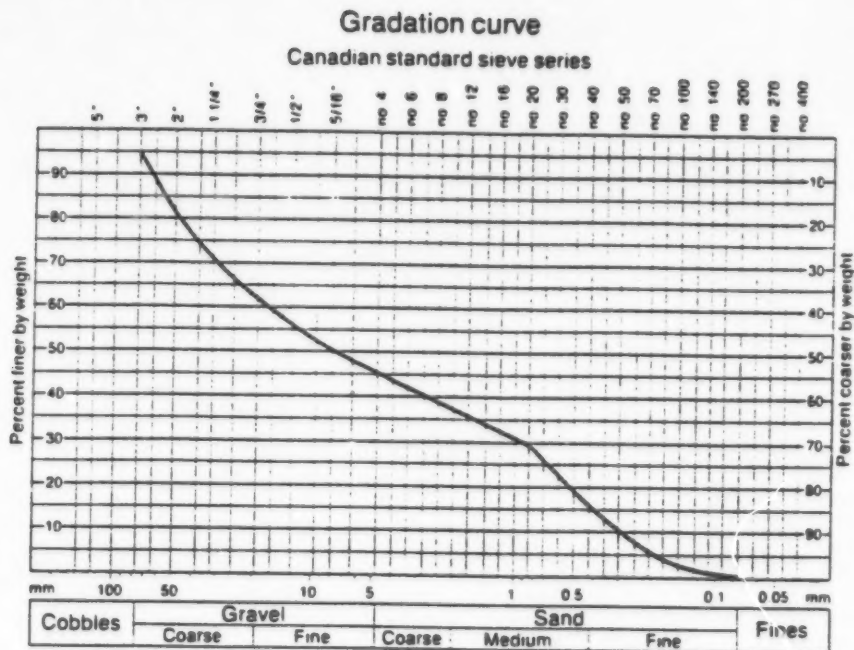
Exposure of fine, iron stained sand 5.25m high. Clasts to 3cm less than 1%. Clasts of igneous rocks from the Canadian Shield are mostly angular to subangular. Quartzites are subround to round.

Pit Location: LSD1 Sec18 Tp83 R11 W4M

Pit Description:

Exposure 9m high of indistinctly bedded sand and gravel. Upper 15-75cm is till with abundant sand and gravel. The material below is slightly dirty in some lenses but generally is clean. Some lenses are moderately iron stained. Maximum clast size is 40cm. Clasts compose 35% of the material and are primarily subangular to subrounded igneous rocks from the Canadian Shield with quartzite and hard sandstone. The presence of ironstone and abundant, crumbly schist clasts does not suggest this material is good for concrete production.

Gradation:	13.1% cobbles	30.7% gravel
	55.1% sand	1.1% fines

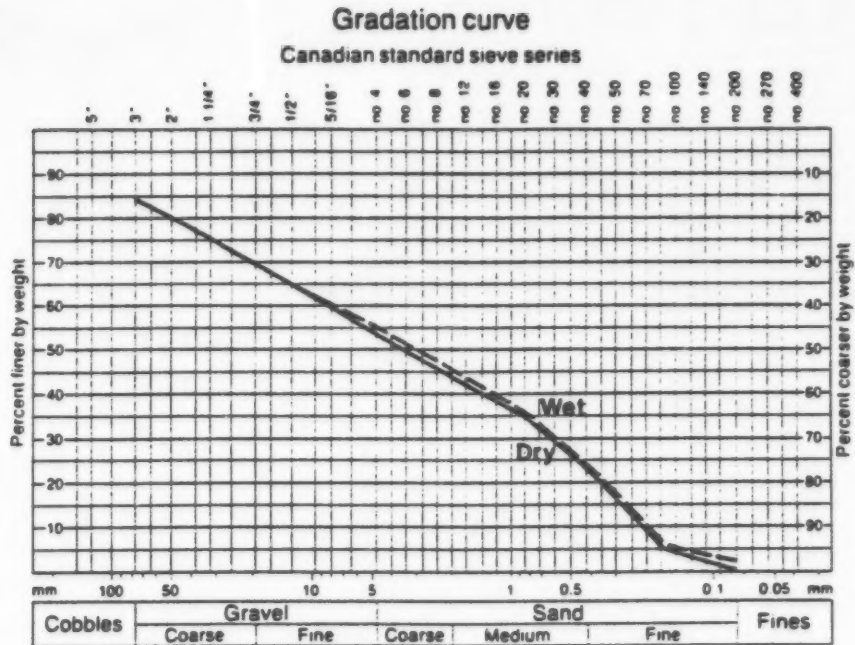


Pit Location: LSD9 Sec7 Tp83 R11 W4M

Pit Description:

Exposure of indistinctly horizontally bedded, poorly graded, clean gravelly sand. Maximum clast size is 40cm. Clasts compose less than 25% of the material and consist primarily of igneous rocks from the Canadian Shield with hard sandstone and quartzite. Ironstone, a few clay and crumbly schist clasts are present. Results of an eastward traverse 190m along a cut line to the highest elevation away from the pit indicate that the material probably is similar to that exposed in the pit.

Gradation:	15.5% cobbles 52.6% sand	30.7% gravel 1.2% fines	dry sieve
	15.5% cobbles 51.5% sand	30.7% gravel 2.6% fines	wet sieve



DEPOSIT 6

LOCATION: LSD6,7,10,11,14 Sec30 Tp83 R10 W4M

No. of associated pits/sites: 1

No. of samples analysed: None

DEPOSIT DESCRIPTION:

See site description below.

Site Location: LSD11 Sec30 Tp83 R10 W4M

Site Description:

Clean fine to medium grained sand with clasts to 5cm less than 1%.
Mollard (1974) Site 173.

PITS/SITES OUTSIDE DEPOSIT BOUNDARIES

Site Location: LSD7 Sec32 Tp83 R11 W4M

Site Description:

Primarily pine forest with a few poplars on clayey silt with no clasts.

Site Location: LSD10 Sec31 Tp83 R11 W4M

Site Description:

Veneer 10cm thick of clean, fine to medium grained sand over clayey silt with clasts less than 0.5%. Pine forest cover.

Site Location: LSD10 Sec28 Tp83 R11 W4M

Site Description:

Slightly clayey silt to fine sand with clasts to 10cm approximately 1%. Pine, spruce and poplar forest cover.

Site Location: LSD13 Sec26 Tp83 R11 W4M

Site Description:

Clean, fine to coarse grained sand 35cm thick with 1% clasts to 10cm, underlain by clayey silt.

Site Location: LSD5 Sec21 Tp83 R11 W4M

Site Description:

Helicopter flyover. Primarily poplar forest with scattered pines. Probably underlain with clayey silt or till.

Site Location: LSD16 Sec19 Tp83 R11 W4M

Site Description:

Clayey silt with clasts to 15cm less than 1%. Primarily spruce forest with a few pines.

Pit Location: LSD10 Sec20 Tp83 R11 W4M

Pit Description:

Borrow pit in till with clasts to 30cm less than 3%. Mostly spruce and poplar forest with scattered pines.

Site Location: LSD6 Sec7 Tp83 R10 W4M

Site Description:

Clayey silt. Spruce and pine forest.

**MAPS
NOT
FILMED**

**CARTES
OMISES**